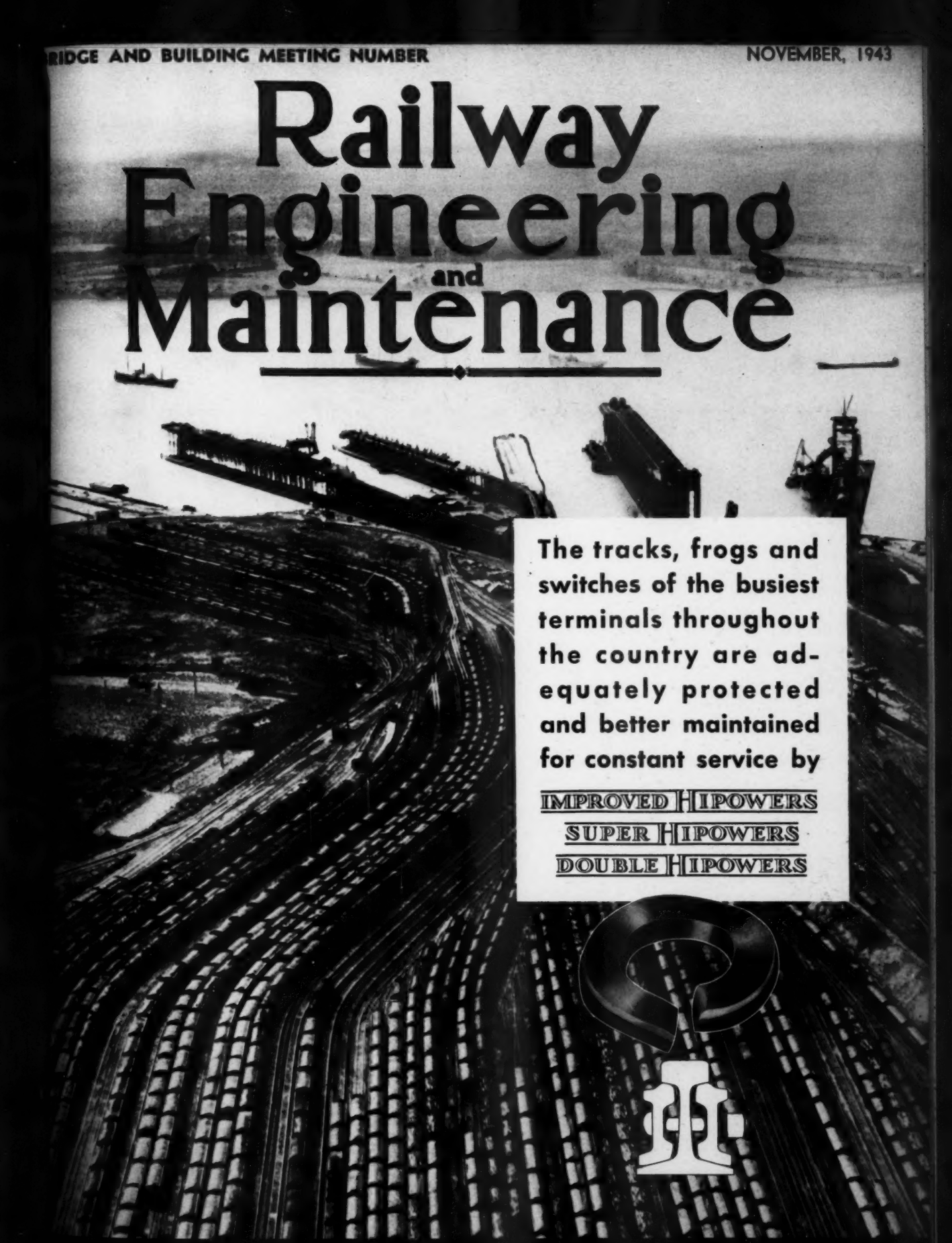
RIDGE AND BUILDING MEETING NUMBER NOVEMBER, 1943

Railway Engineering and Maintenance



The tracks, frogs and switches of the busiest terminals throughout the country are adequately protected and better maintained for constant service by

IMPROVED HIPOWERS
SUPER HIPOWERS
DOUBLE HIPOWERS

Reliance HY-CROME Spring Washers

CROSSING
HY-CROME

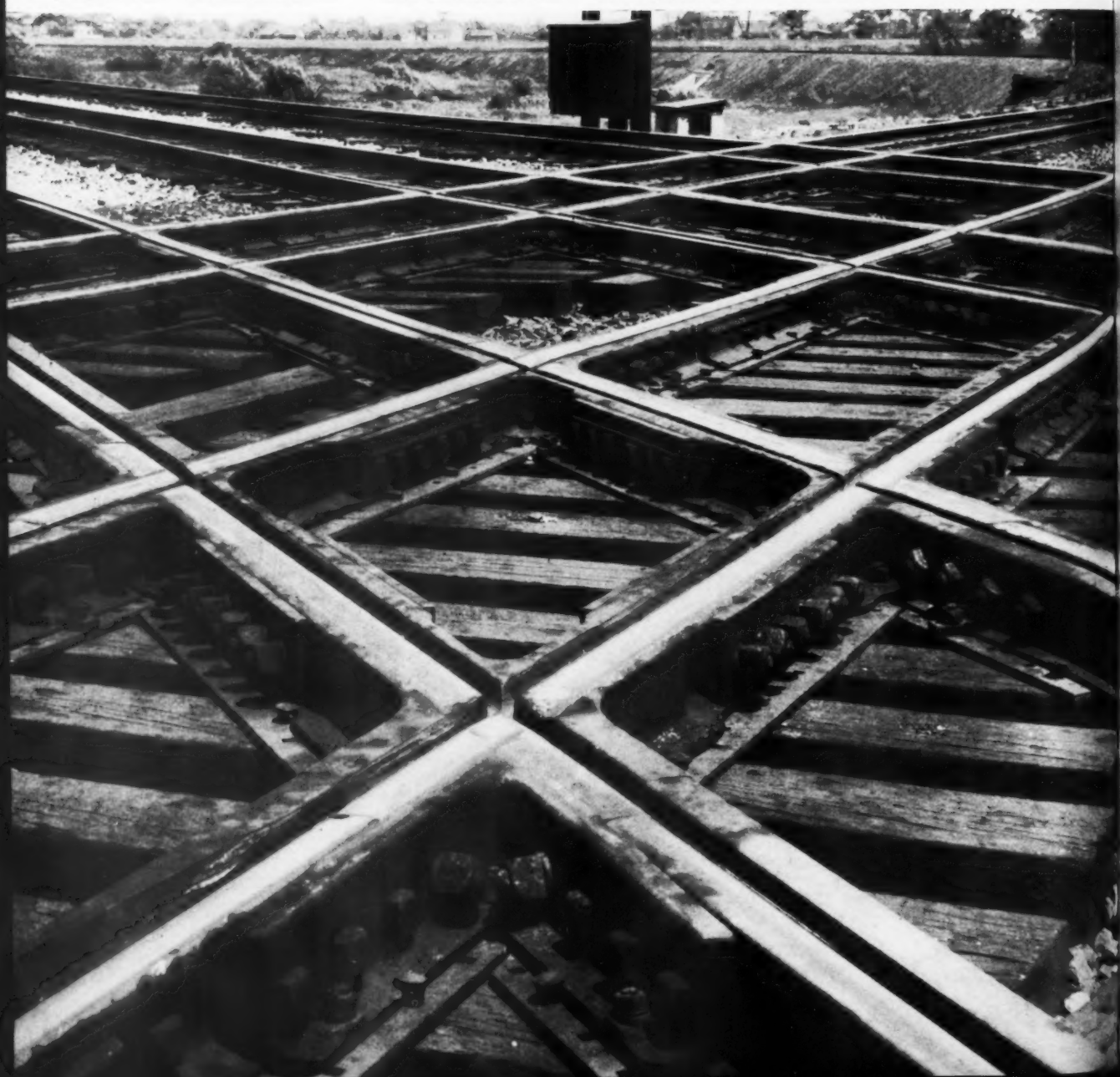
● We don't know how many trains cross here in twenty-four hours—it's a military secret. We do know every train crossing here creates WEAR. Today more trains carrying heavier loads are using this crossing.

● Manpower and materials are critical, and this crossing must be maintained to a maximum efficiency. To conserve both only one device automatically compensates for wear while maintaining tension.

● Crossing bolts require special maintenance and CROSSING HY-CROME SPRING WASHERS were developed to meet such stresses. Their width possesses the necessary bearing surface to accommodate the wide crossing nut. Safeguard these cross-overs efficiently with CROSSING HY-CROME SPRING WASHERS.

EATON MANUFACTURING COMPANY
RELIANCE SPRING WASHER DIVISION
MASSILLON, OHIO

HOW MANY TRAINS CROSS HERE A DAY?



● NO-OX-ID protective coating can be brushed on over rust without expensive pre-cleaning. It applies readily, and therefore large areas can be covered in little time. This enables you to maintain your bridges with fewer men and at lower cost . . . besides NO-OX-ID coating lasts longer.

All you need to do is to scrape off the loose rust patches and then brush on a coat of NO-OX-ID over the remaining rust and old paint. NO-OX-ID will penetrate to the metal and stop further corrosion.

NO-OX-ID acts in two ways: mechanically, to exclude moisture and oxygen from the surface and chemically to inhibit corrosion under the film. It offers the most economical method of bridge maintenance. Write for further information.

•[*For Victory, Buy United States War Bonds and Stamps*]•

"THE LEADER FOR 25 YEARS"

NO-OX-ID

IRON RUST

rust preventive

DEARBORN CHEMICAL COMPANY
Dept. U, 310 S. Michigan Ave., Chicago 4, Illinois
NEW YORK • LOS ANGELES • TORONTO

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the postoffice at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago 3, Ill.

ASK THE SOLDIER WHO USED ONE

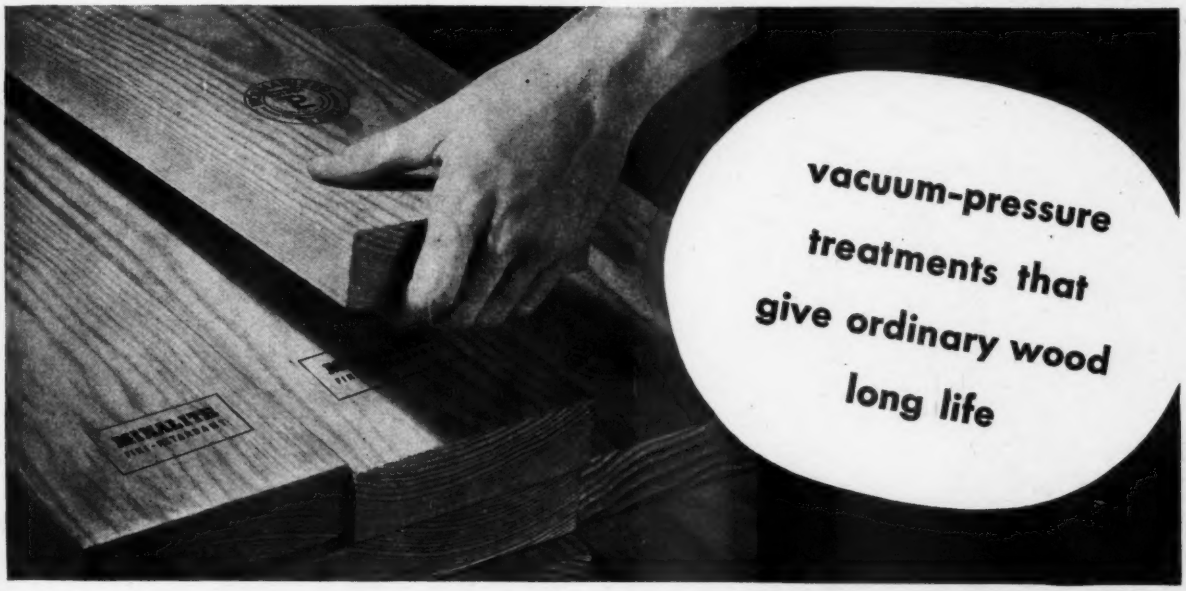
The Barco Portable Gasoline Hammer is taking a beating! It's taking a beating at the hands of experts . . . the Army Engineers, the Army Signal Corps, the Marines . . . around the world. We're proud to report that the Barco Hammer is not only "taking it", but it is "dishing it out" so satisfactorily that nearly our entire production is going to the armed services.

So after this war, just ask a soldier who used a Barco Portable Gasoline Hammer. Ask him about its ruggedness, its easy operation, its extreme portability! He'll give you the same straight answers we've been receiving.

Barco Manufacturing Company, Not Inc., 1805 Winnemac Ave., Chicago, Ill.
In Canada: The Holden Co., Ltd.,

BARCO PORTABLE GASOLINE HAMMERS

NOW YOU HAVE TWO



WOLMAN SALTS* Preservative

Wolmanized Lumber*—wood impregnated with Wolman Salts—is highly resistant to decay and termite attack. Vacuum-pressure treatment drives the preservative deep into the wood; fibre-fixation prevents its washing out or leaching.

Wolmanized Lumber is clean, odorless and paintable. It does not increase the fire hazard. It gives you all of the usual advantages of building with wood—light weight, ease of handling and erection, strength and resilience.

MINALITH* Fire Retardant

Wood that has been pressure-treated with Minalith fire retardant will not support combustion. Because it will not catch or spread fire, it helps confine fire to points of origin. It maintains its load-bearing strength without sudden collapse.

Minalith fire retardant has no disagreeable odor or harmful effect on workmen's skin or clothing. When properly dried, it can be painted. Lumber so treated is extremely valuable wherever fire is an ever-present hazard.

WOLMANIZED LUMBER has been used for many years by the railroads—in bridges and trestles, shops and engine houses, coaling stations and water tanks, warehouses and freight stations, passenger stations and a score more types of railway structures. Service records covering many millions of feet of this lumber prove its worth. The same high quality of pressure treatment that made these records possible is now available to you in Minalith-treated lumber. American Lumber and Treating Co., 1659 McCormick Bldg., Chicago 4, Ill.

*Registered Trade Marks

WOOD THAT'S *Alloyed* **FOR SAFETY AND ENDURANCE**

AMERICAN LUMBER & TREATING COMPANY

SCRAM-YOU SISSIES!

Harcote's workin' on the railroad now! — licking wear and abrasion wherever they meet! For here's an electrode that means business . . . the business of rebuilding and hard surfacing worn parts to double and treble their normal lives.

Protecting softer steels against abrasion and wear is Harcote's way of keeping the rolling stock *rolling*. Easy to work, Harcote goes on smoothly and places a weld that's tough, hard and long lasting. Harcote is used on carbon steel, low alloy and high manganese surfaces. See your P&H representative for information and procedures on this and other P&H Alloy Electrodes. Or write us.

P&H

P&H Also Builds a Complete Line of A.C. and D.C. Arc Welders. Write for Literature.

General Offices and Factory:
4606 W. National Ave., Milwaukee 14, Wis.

ARMY E NAVY

Another New Star has been Added to P&H's Army-Navy "E."

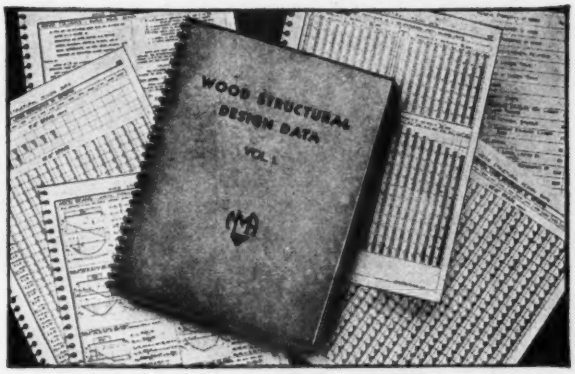
HARNISCHFEGER CORPORATION
WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

Canadian Distribution: The Canadian Fairbanks-Morse Company, Ltd.

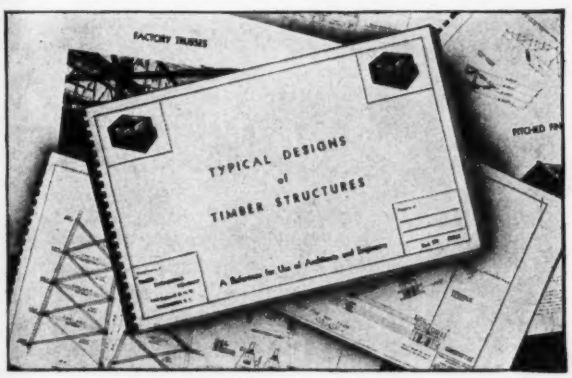
SERVICES TECO HAS FOR YOU

WHEN YOU BUILD WITH WOOD

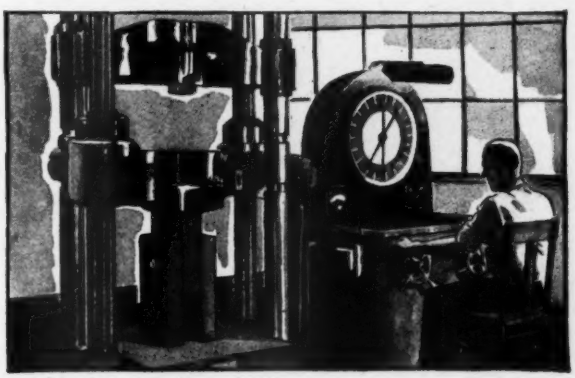
CONSULTING SERVICE. Teco maintains a staff of engineers to consult with architects and engineers on their design problems. Teco Connector distributors and fabricators in all parts of the country also render helpful services.



DESIGN DATA SERVICE. Teco has available for architects and engineers complete data on all phases of timber design, including tables and charts on timber beams, columns, floors, connector loads, bolt loads, stresses, etc.



TYPICAL DESIGN SERVICE. "Typical Designs of Timber Structures"—a 100-page book—is available to architects and engineers free upon request. Copies of several hundred other designs of typical Teco Timber Structures are also available on request.



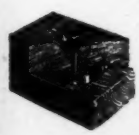
RESEARCH SERVICE. Teco conducts a continuous research program through laboratories as well as sponsoring research at outstanding engineering colleges to increase the design knowledge of timber designers.

Wood is often referred to as the *rediscovered* material, due to its development by science for plastics, laminations and heavy construction.

Engineering science that developed the Teco Connector System of timber construction is responsible for the position timber occupies as a leading heavy construction material.

The Teco timber system serves our war effort . . . it will *serve you* in peace times too.

TIMBER ENGINEERING COMPANY
—Washington—Chicago—
Minneapolis—Portland.



The **TECO** *Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.*

Specify
TECO
CONNECTORS
★ TOOLS ★

ENDORSED BY LEADING LUMBER MANUFACTURERS AND FABRICATORS

FIRST ON THE RAILS AND STILL FIRST

Designed by Men Who Know Railroading

Fairbanks-Morse Sheffield and Eclipse Motor cars are still first on the rails because they have *all* of the features a car should have . . . and all of those features are *good.*

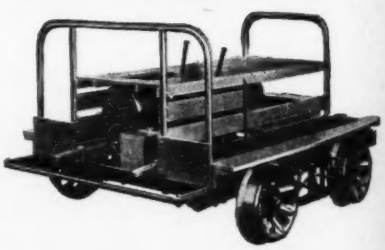
There are 12 models—water cooled, air cooled, chain drive, belt drive. *Eclipse* models are belt-driven. *Sheffield* Models are chain-driven.

Sheffield Model 40B with cab

Two-cylinder air-cooled engine permits full load operation for hours without overheating. Engine develops exceptionally high torque at low speeds. Friction transmission. Chain drive. Steel frame. Thousands in service.

Sheffield Model 40B with special safety railing

Sheffield Model 53
Weighs 929 pounds with rear end lift of only 124 pounds. Has 8- to 13-hp., water-cooled motor with air-cooled head. Space for full section gang and tools.



Buy War Bonds

FAIRBANKS, MORSE & CO.

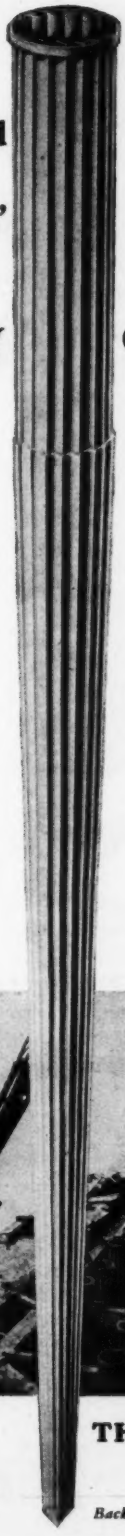
FAIRBANKS-MORSE BUILDING, CHICAGO, ILL.

RAILROAD SALES OFFICES: NEW YORK • BOSTON • CHICAGO • ST. LOUIS • ST. PAUL
CINCINNATI • ATLANTA • NEW ORLEANS • DALLAS • SAN FRANCISCO

Export Division: 80 Broad Street, New York City

Canada: Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Winnipeg

Job-experienced builders say: "MONOTUBES' *Speedy Handling* Conserves Manpower"



TODAY, when manpower is a most precious asset, you can save both time and labor in the installation of cast-in-place concrete piles by using Union Metal Monotubes. Monotube tapered steel casings are light in weight, permit fast and economical handling.

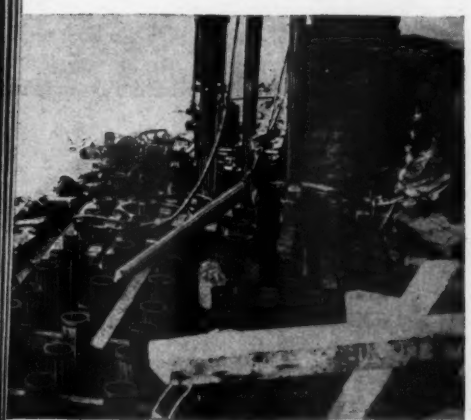
Other outstanding Monotube features are:

SPEEDY DRIVING—Monotubes are so strong and rigid they require no heavy core or mandrel and can be driven with average job equipment.

SPEEDY EXTENSION—The use of Extendible Monotubes permits installation of varying pile lengths (even in low headroom), without delay or waste.

SPEEDY INSPECTION—The hollow tubular design of Monotubes enables you to inspect the casings quickly and thoroughly from top to toe prior to concreting.

Monotubes are available in a wide range of gauges, sizes, and tapers to meet exacting requirements in varying soil conditions. Write for your copy of the Monotube Catalog 68A which gives additional valuable information.



THE UNION METAL MFG. CO.

Canton, Ohio

Back the Men who are at the Front for You—Buy More War Bonds

The TREMITES* Punch *IN* But *NEVER OUT!*

. . . Safeguard With RMC PLASTIC

What workers! Wherever steel rail joints are unprotected . . . or only partially protected . . . the Tremites, Rusty, Briny and Dirty, promptly punch IN, devoting twenty-four hours a day to their work of destruction. Keep the Tremites off *your* payroll with RMC PLASTIC . . . the tested and time-proved metal-preserving and lubricating compound that is saving thousands of tons of practically irreplaceable steel rails for the railroads every year.

RMC PLASTIC, packed solidly into every section of the joint assembly, thoroughly lubricates and protects the fishing surfaces, shanks and threads of nuts and bolts. When bolts are tightened properly, frozen joints due to corrosion are eliminated and proper rail expansion and contraction are permitted, which reduces the danger of kinks and other irregularities in the tracks.

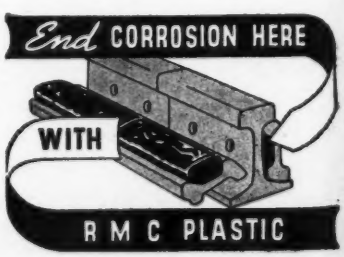
RMC PLASTIC is Easy to Apply

RMC Blocks are placed on the inner faces of the joint bars before assembling. The joint bars are then applied to the rails in the regular manner. As bolts are taken up, the pressure packs the preservative into every section of the joint assembly.

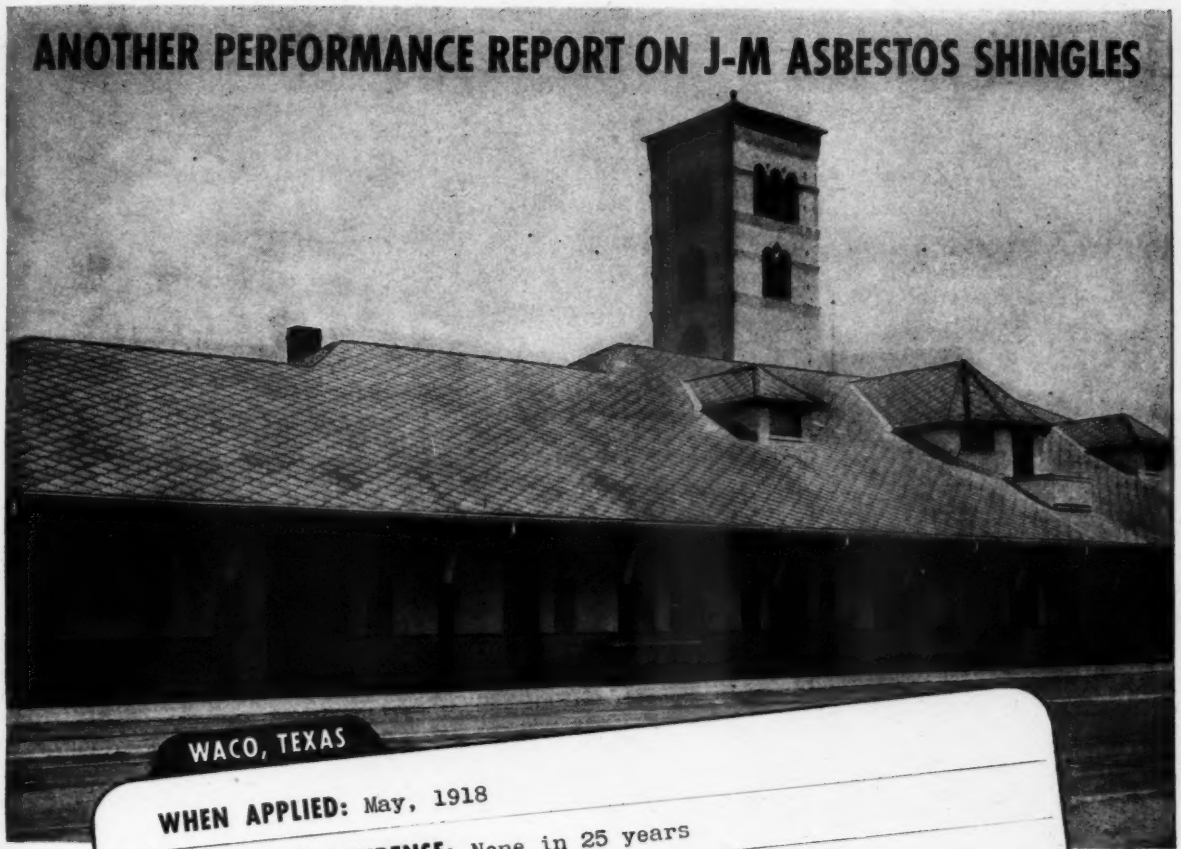
Get a Supply of RMC PLASTIC now —while you can get ALL you need.

*TREMITES—Three Mites

RAILWAY MAINTENANCE CORP.
PITTSBURGH PENNSYLVANIA



ANOTHER PERFORMANCE REPORT ON J-M ASBESTOS SHINGLES



WACO, TEXAS

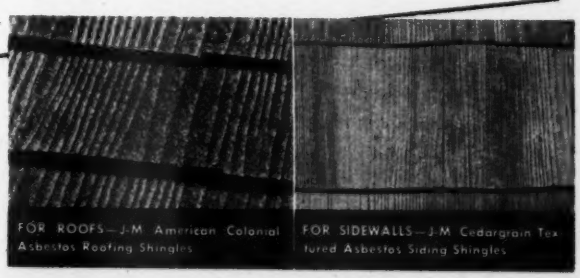
WHEN APPLIED: May, 1918

MAINTENANCE EXPENSE: None in 25 years

PRESENT CONDITION: No sign of deterioration

REMARKS:

After a quarter century of exposure to wind, rain and the brilliant Texas sun, the Johns-Manville Asbestos Shingles on this railroad station roof are good for many more years of service. That's because these J-M shingles—made of asbestos and cement—are rotproof, weatherproof, fireproof, permanent as stone. And they require no preservative treatment.



FOR ROOFS—J-M American Colonial Asbestos Roofing Shingles

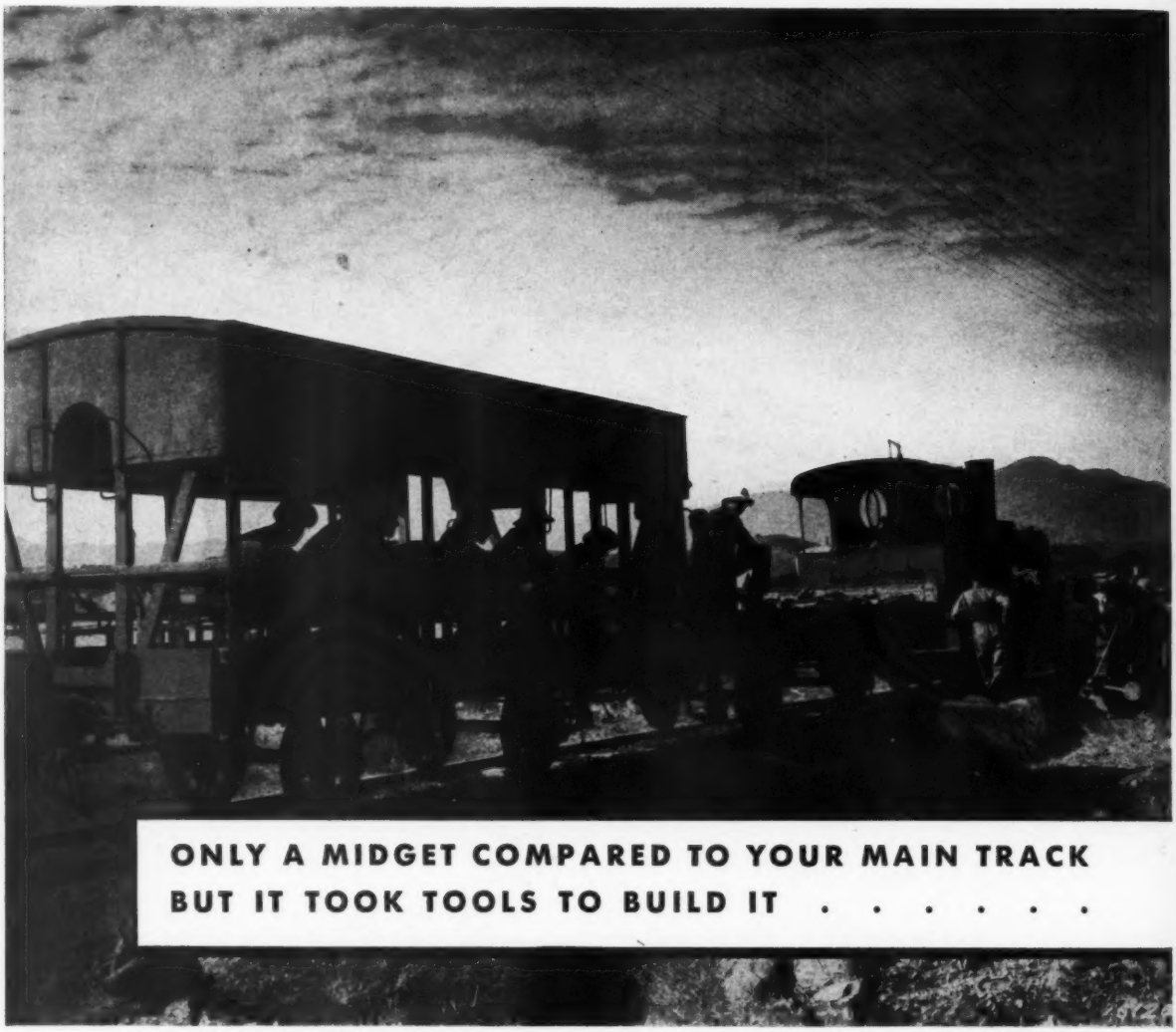
FOR SIDEWALLS—J-M Cedargrain Textured Asbestos Siding Shingles

Johns-Manville Asbestos Roofing and Siding Shingles are now available for permanent repairs and new installations where necessary. For complete details, write Johns-Manville at New York, Chicago, Cleveland, St. Louis or San Francisco.

JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE
85 YEARS OF SERVICE TO TRANSPORTATION

Insulations • Packings • Friction Materials • Refractory Cements • Building Materials



ONLY A MIDGET COMPARED TO YOUR MAIN TRACK
BUT IT TOOK TOOLS TO BUILD IT . . . . . .

Official Photograph U. S. Army Signal Corps

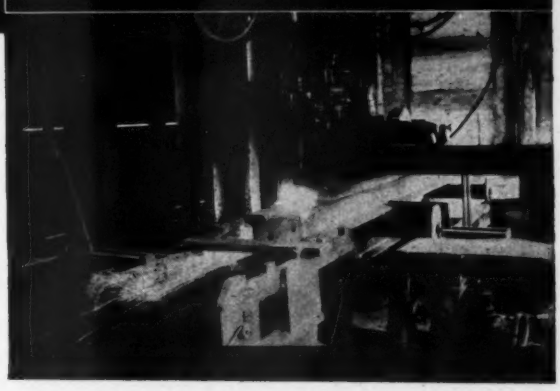
Down on the South Pacific island of New Caledonia this military railroad keeps our troops supplied. It is just a small road, but *tools* had to build it—and *tools* have to maintain it. It is only one of many such roads scattered throughout the world; however, it serves to illustrate why deliveries of Warren Heavy Hand Tools to you are sometimes unavoidably delayed. . . . . .

Regardless of where American railroad battalions go, they must take American equipment and tools with them. Thousands upon thousands of Warren Tools are helping to keep supply lines open to all fronts. Warren Tools also help to build equipment our armies need. So please remember that at times we must "scatter our fire" so our boys can concentrate theirs. . . . . .

WARREN
HEAVY HAND TOOLS

WARREN TOOL CORP. • WARREN, OHIO

Set-up for cropping rails with two Airco Radiagraphs



Top cut being made. Bottom Radiagraph is positioned after top cut has been completed

Here's how one railroad is using Airco machine gas cutting to speed rail end cropping —an important step in a large rail reconditioning program.

Two Airco Radiagraph machines are used, one for cutting through the head and the upper half of the rail web, and the other for cutting through the base and lower portion of the web. Both machines are motor driven and move along tracks positioned at right angles to the rail being cut.

The rail is securely clamped into position and the first cut is made by the upper Radiagraph machine. When this cut is completed, a hinged metal hood is moved over the rail and the cutting process is repeated by the lower Radiagraph.

Two such cutting stations, each equipped with two Airco Radiagraphs, are used by this railroad. Rails are carried on a conveyor line to the first station where the leading end of the rails are cropped. Rail then moves to the second station where the trailing ends are cut. With this method, the combined output averages about 25 rails per hour.

For further details on this Airco machine cutting method, write to your nearest Air Reduction office.

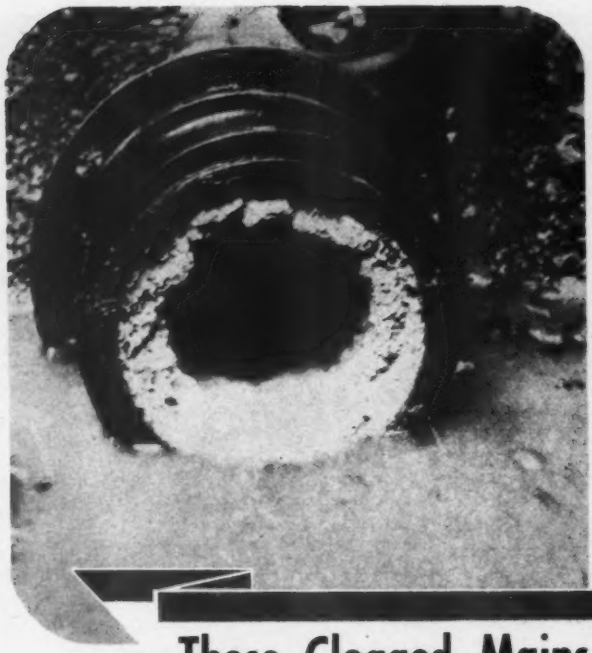
★ BUY UNITED STATES WAR BONDS ★

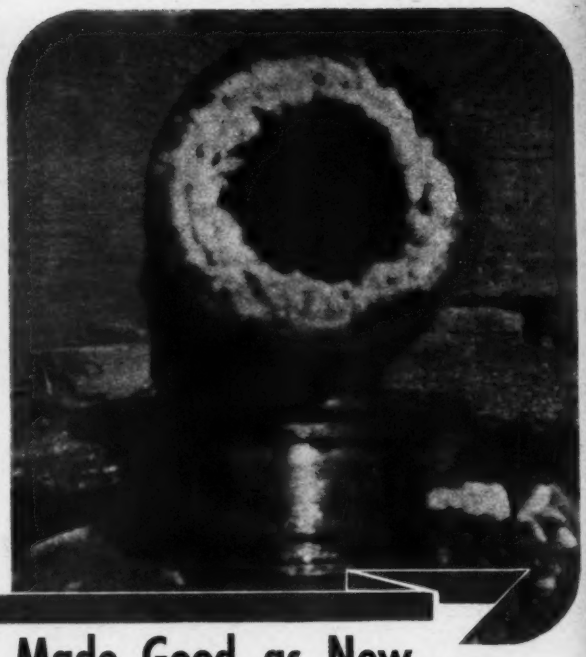
AIRCO WILSON

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON, TEXAS





These Clogged Mains Made Good as New

JOB ANALYSIS

of a recent Cleaning Contract at Youngstown, Ohio

Length of main	10,600 ft.
Size of main	8" Cast iron
Cleaning time	75 minutes
Deposit removed	60 tons
Power savings	16%
Type of cleaning	Hydraulic
45 degree ells	7
Quantity water before cleaning	390 gals./min. at 90# pressure
Quantity water required	450 gals./min.
Quantity water after cleaning at 40#	750 gals./min. (estimated)
Present pumping time at 40# pressure	7 hrs. less than before cleaning

Don't Scrap Your Pipe Let Us Clean It For You

Stop! Don't even plan to buy new pumps or larger mains . . . until you see us about it. Let us tell you how we make your old pipes practically as good as new by our exclusive hydraulic and mechanical systems of pipe cleaning.

The PITTSBURGH PIPE CLEANER COMPANY offers to the railroads a complete pipe cleaning, engineering and operating service.

Let us Help Obtain

Increased pressure and flow
Lower operating costs
Greater fire protection
from your present pipes and water mains

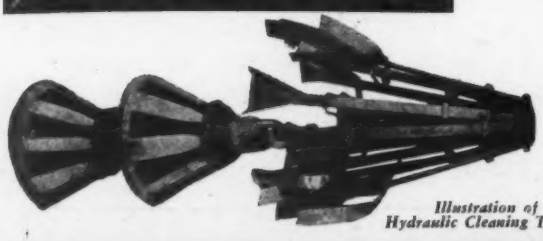


Illustration of 16" Hydraulic Cleaning Tool

Write us today for illustrated circulars with actual facts from the field and let us show you how we can aid you.

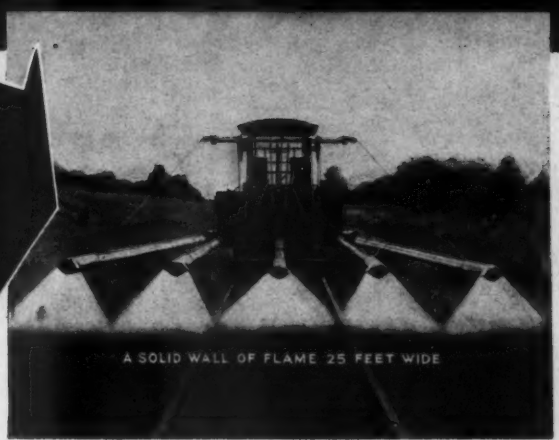
PITTSBURGH PIPE CLEANER COMPANY

433 Melwood Street — Pittsburgh, Penna.

MODERN TRAINS DEMAND

Modern Track Maintenance

WOOLERY WEED BURNERS



Woolery 5-burner in operation

AS THE "Eagles" typify the latest in transportation on the Missouri Pacific, so do Woolery Weed Burners represent the most modern and efficient method of weed eradication.

On more than seventy-five roads Woolery Weed Burners are setting records for fastest and most thorough maintenance of clean track all-year round . . . convincingly demonstrating in actual everyday use their efficiency in solving the burning question of weed destruction with minimum employment of manpower. Woolery Weed Burners are available in 5-burner, 3-burner, 2-burner and 1-burner Models.

Other Woolery Maintenance Units

Woolery Tie Cutters and Creosote Sprayers are also helping many railroads maintain track the modern way, with minimum expenditure of labor, time and money.

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

TIE CUTTERS • SWITCH HEATERS • MOTOR CARS

RAILWAY WEED BURNERS • BOLT TIGHTENERS

To Prolong the Life of Your *Insulated Rail Joints—*

—it is essential that the FIBRE RENEWAL parts receive the same care in manufacture, both as to quality of material and accuracy of fit as do the parts for the ORIGINAL INSULATED JOINT ASSEMBLY.

We have a trained and experienced Resident Inspector at the fibre production plant who is constantly checking details. Thus, good fit protects the fibre against damage and is essential for long service.

Fibre Parts—Efficiently Designed—Accurately Made.

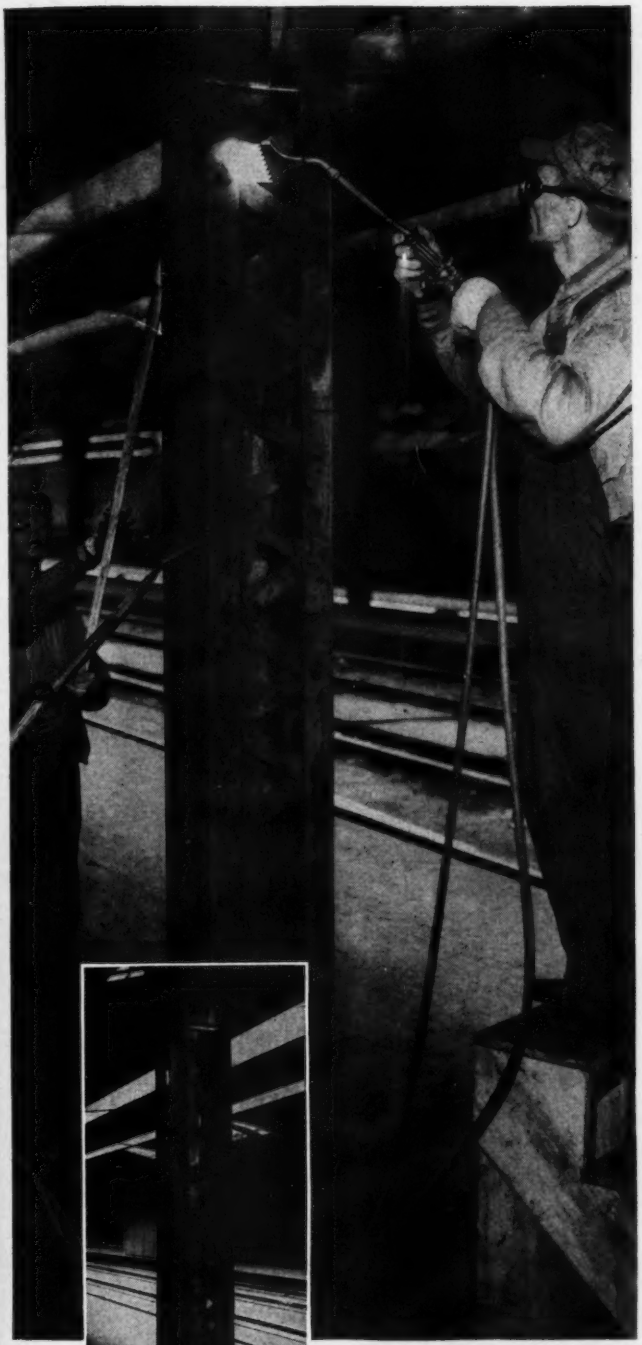
Calipering sheets of fibre—variation between max. and min. thickness must not exceed 1/100 of an inch.

Checking fibre head pieces after punching—tolerance of longitudinal location of bolt slots may be plus or minus 1/16 of an inch.

Checking angle of bend in fibre base piece—angle of bend at time of shipment shall be not greater than 25°.

Checking length and packing for shipment—tolerance of over-all length may be plus or minus 1/8 inch. Packing to prevent damage during shipment.

THE RAIL JOINT COMPANY INC.
50 CHURCH STREET NEW YORK, N. Y.



(Above)—Station shed columns being flame-cleaned. (Left)—The flame-cleaned column ready for painting.

Flame-Cleaning

Speeds Repainting of Structural Steel

● Oxy-acetylene flame-cleaning by Oxweld's method is a quick and economical way to remove residual paint, scale, rust, and moisture from structural steel preparatory to painting. This procedure is particularly useful on irregular or other hard-to-get-at surfaces such as the train shed column shown here, where the downspout inside the column had to be cleaned as well as the outer surfaces. On this job, Oxweld's flame-cleaning method removed scale and paint from these columns so effectively that the steel was cleaned down to its original surface for the first time in nearly 30 years. As a result, a quicker, better, more lasting paint job was made possible. Flame-cleaning is also being used to good advantage on tanks, bridges, pipe, cars, coaches, and many other steel structures.

THE OXWELD RAILROAD SERVICE COMPANY

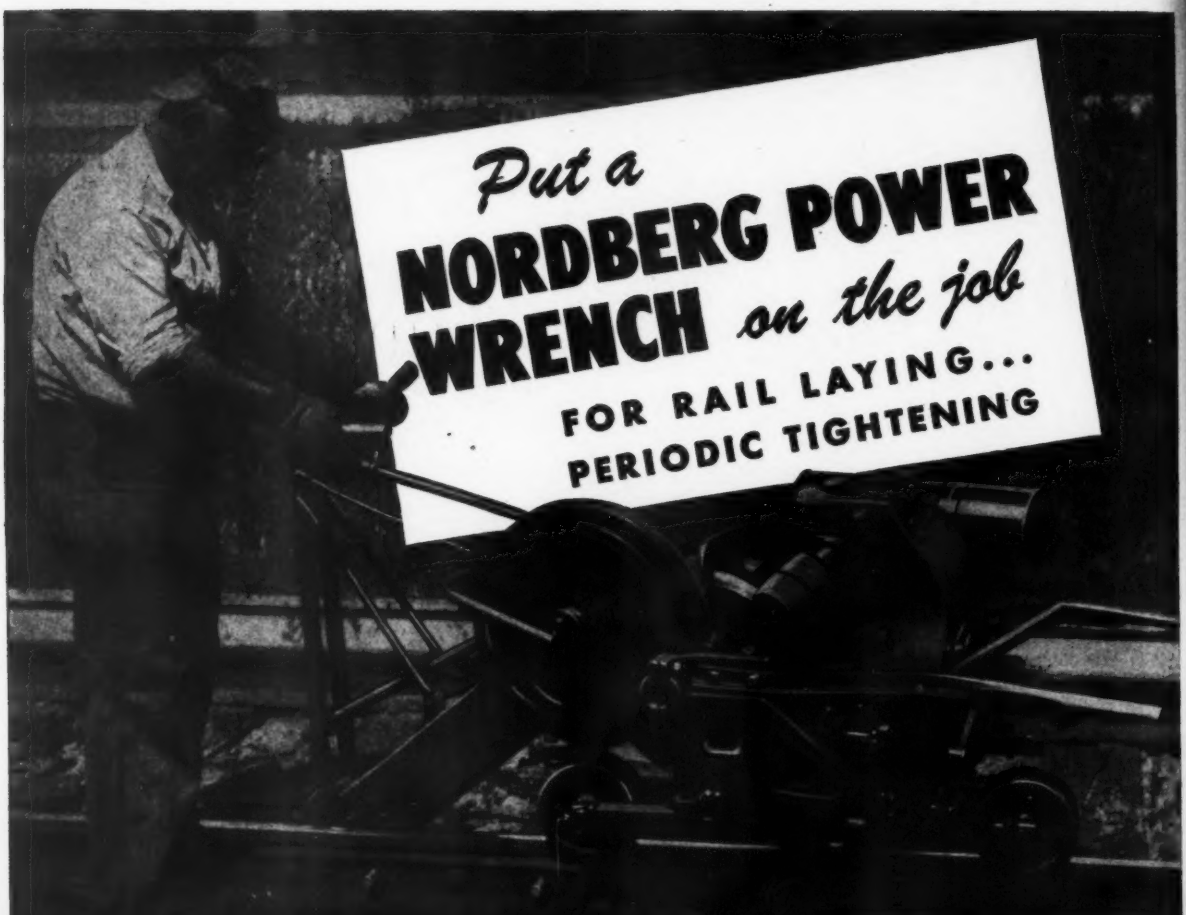
Unit of Union Carbide and Carbon Corporation

UCC

Carbide and Carbon Building — Chicago and New York

BUY UNITED STATES WAR BONDS AND STAMPS

SINCE 1912 - THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS



Put a NORDBERG POWER WRENCH *on the job*

FOR RAIL LAYING... PERIODIC TIGHTENING

Here the Power Wrench is removing the nuts from the joints on a rail laying job.

On those tough jobs of removing the nuts from the old rail, the Nordberg Power Wrench will easily keep ahead of the rail laying gang. Tightening the nuts on the newly laid rail can be done in a fraction of the time required by oldtime hand methods. For normal joint maintenance, the uniform tightness given to every bolt assures smoother riding track, retardment of rail end batter and increased rail life. An adjustable spring loaded overload release maintains a uniformity of torque within 5%. This machine being rugged, of light weight and full revolving, meets the requirements of every rail joint tightening job.

A FULL LINE OF POWER TOOLS FOR YOUR MAINTENANCE JOBS

- SPIKE PULLER
- RAIL DRILL
- POWER JACK
- ADZING MACHINE
- UTILITY GRINDER
- SURFACE GRINDER
- MIDGET GRINDER
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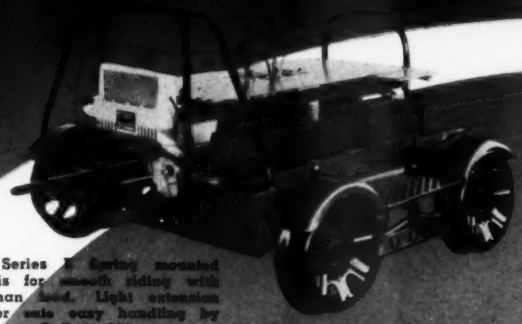
- TRACK SHIFTER

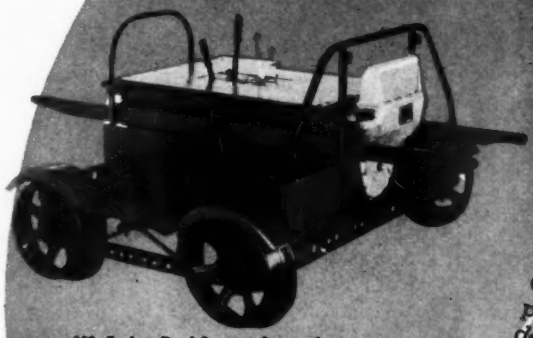
NORDBERG MACHINERY

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

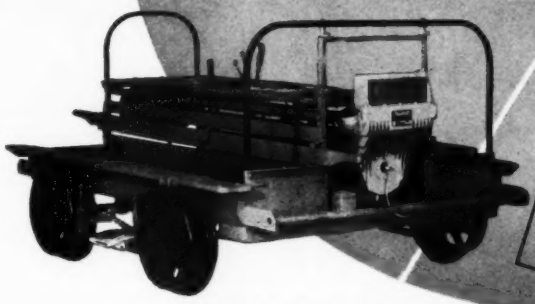
Export Representative—WONHAM Inc.—44 Whitehall St., New York



M19 Series F Spring mounted chassis for smooth riding with 1-4 man load. Light extension lift for easy handling by one man. Bulletin 396.



M9 Series D 1-2 man Inspection Car. Surplus powered for tough going. Light in weight for easy handling. Bulletin 391.



M14 Series G Amply powered and ruggedly built for 6-man section gang work but light enough for one or two man handling. Bulletin 397.

A3 Series C An outstanding gang car equipped with Hercules 4-cyl. 30 H. P. Engine. Has 4-speed transmission forward or reverse. Bulletin 400.

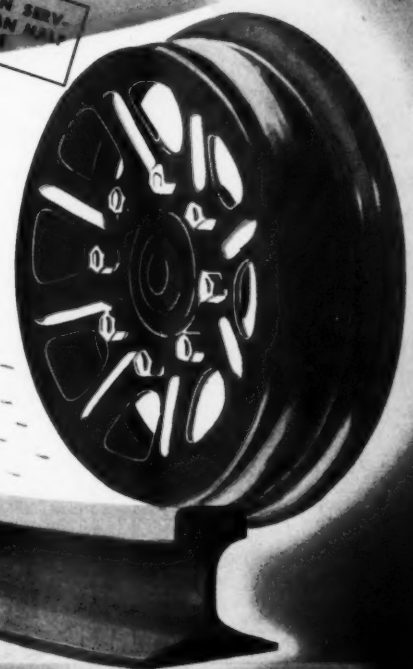
Wheels on Rails

Whatever the weather . . . how steep the grades . . . how full the loads . . . wherever wheels may contact rails, Fairmont Railway Motor Cars will get to the job and back again . . . because they are engineered, constructed, and powered to meet and overcome every emergency in the department of railroad maintenance.

From the smallest Inspection car to the huskiest Section or Gang Car, they have been proved by performance in the line of duty for *dependability, safety,* and *comfort.*

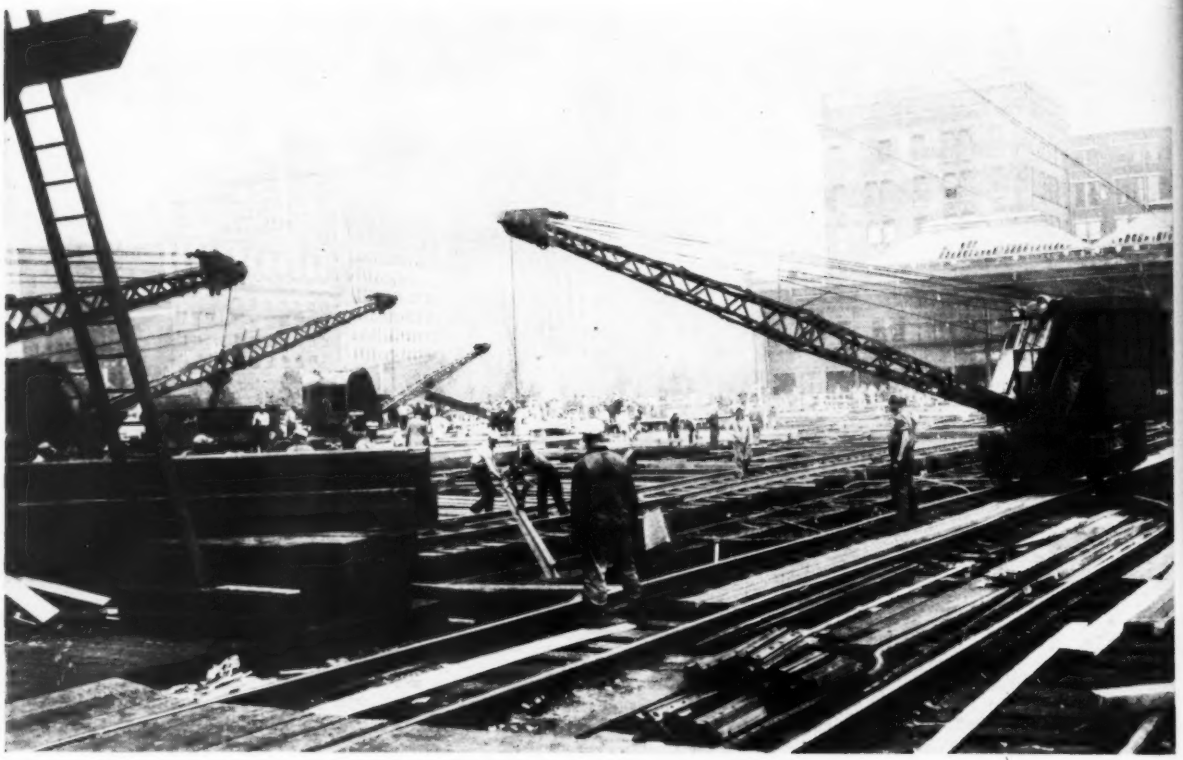
The fact that the Fairmont Line has been 34 years in the building, and that it is exclusively the business of this company, explains why Fairmont cars today are dominantly the preference of railroad executives and operators alike. Fairmont Railway Motors, Inc., Fairmont Minn.

OF ALL THE CARS IN SERVICE TODAY MORE THAN HALF ARE FAIRMONTS



Performance ON THE JOB COUNTS

Fairmont Railway Motor Cars



5 BURRO CRANES

Within one week, after the disastrous 9-hour fire had gutted its 16-track Broad Street Terminal in Philadelphia, the Pennsylvania R.R. had all regularly scheduled trains operating out of this station. This is a record breaking achievement, a tribute to the competence of the Pennsylvania organization, the competence of its supervision, capability of its maintenance and construction department, its work crews and its modern equipment.

It was a titantic job—from 15th to 16th Streets all canopies burned, all catenary wires down, all ties charred, all rails warped and the giant supporting beams twisted and bent—a solid block of tangled debris, two stories high, cleaned up and rebuilt—4550 lin. ft. of new elevated track, 2400 lin. ft. of new platforms and canopies, a block of supporting structure, aligned, shored up or replaced.

Among the first equipment to arrive, the busiest throughout the job, were 5 BURRO CRANES—as efficient in emergencies as in everyday clearing, constructing and track laying.

Write for Bulletins F-100, F-110

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CULLEN-FRIESTEDT COMPANY

1301 S. Kilbourn Ave. CHICAGO 23, U. S. A.

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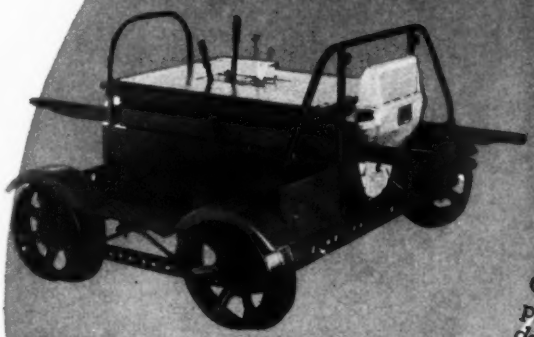

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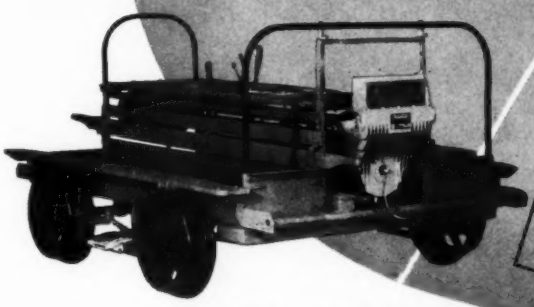

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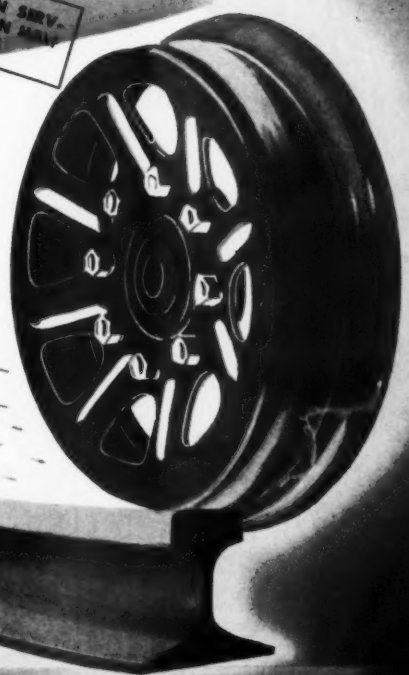

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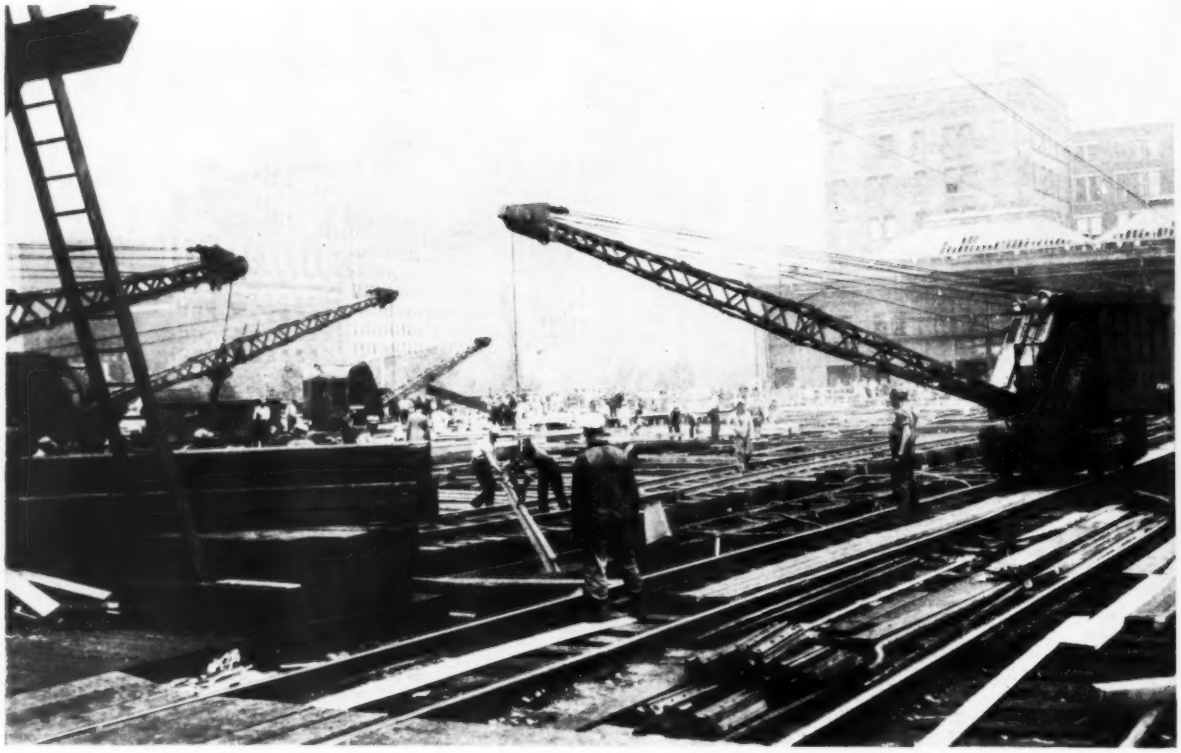

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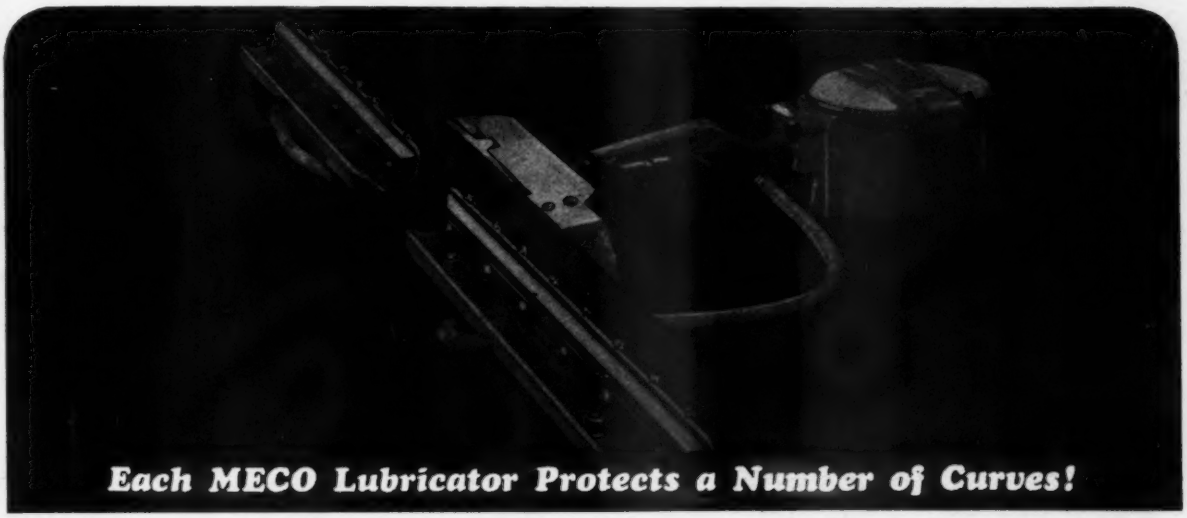
CULLEN-FRIESTEDT COMPANY

1301 S. Kilbourn Ave. CHICAGO 23, U. S. A.

Put a "Slow Order" on Curve-Rail Wear



Each MECO Lubricator Protects a Number of Curves!

HERE'S HOW! *Meco-Grease* Your Curves NOW

✓Save Materials

- Increase life of curve rails 2 to 4 times.
- Increase life of switch and curve rails in yards.
- Increase life of ties otherwise spike-killed in curves.
- Increase life of wheel flanges.

✓Reduce Manpower Requirements

Realize tremendous savings in man hours

- for relaying or transposing curve rails.
- for renewing spike-killed ties.
- for realigning and regauging curves.
- for replacing wheels with sharp flanges.

✓Speed Train Movements

Experience with 6000 Mecos on over 130 American Railroads has proven that MECOLUBRICATION

- permits faster speeds with safety.
- increases tonnage ratings up to 10%.
- eases operation over turnouts in yards.
- minimizes derailment hazards.

MAINTENANCE EQUIPMENT COMPANY

RAILWAY EXCHANGE BUILDING ★ CHICAGO, ILLINOIS

WOODINGS
RAIL ANCHOR

Courtesy of Atchison, Topeka & Santa Fe Railway
The Santa Fe Magazine—September 1943.

Santa Fe

W

WOODINGS FORGE & TOOL CO.

VERONA, PA.

THE NEW

ORTON-JUPITER PILE DRIVER

• The locomotive type pile driver—with collapsible leads and horizontal trusses—which can go out and drive pile trestles, then at high speed under its own power get off the main line track, has been a good tool for railroads which could afford an expensive one-purpose unit • Orton has now added to this traditional machine a new versatility which enables it to be used for so many other purposes that it is well within the budget requirements of all Class A railroads, justifying the purchase of many more of these machines than has been good practice in the past • The new Orton pile driver is built with the long car body and horizontal trusses carrying the leads so desirable for heavy pile-driving where the load must be kept to a minimum on each bent. These trusses and leads can be quickly removed and a crane-type boom substituted. The pile driver then becomes a high-speed, heavy-duty crane, which can place concrete caps on top of the piles, handle girders, store and drive heavy concrete piles and do all of the heavy lifting before and after the piles are driven • In the Jupiter the railroad has a high-speed locomotive pile driver ready to take care of emergency washouts and similar work. It also has a machine capable of so much more work that many railroads will find it economical to have one in every division, with a correspondingly increased ability to greatly reduce time losses in repairing washed-out track.

Send for detailed specifications

ORTON CRANE & SHOVEL COMPANY · 608 S. Dearborn St., Chicago 5, Ill.

NEW VERSATILITY!

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO 3, ILL.

Subject: The Advertising You Read

November 1, 1943

Dear Reader:

In an article in a recent issue of a magazine circulating among those concerned with the preparation of advertising, the author revealed such a clear understanding of the needs of readers of business papers, such as Railway Engineering and Maintenance, that I am quoting excerpts from it in the belief that they reflect your attitude. Addressing himself to advertisers, this writer says that "the readers of business publications are probably the most intelligent and critical audience you have ever tried to reach. These readers subscribe to their business papers," he continues, "to get helpful suggestions for their work and concrete facts and figures on equipment. In selling your product, give them these things, even if it means long copy.

"If you have something to say, say it direct—and as simply as you can. Imagine yourself sitting across the desk from a busy executive who has given you a few minutes of his valuable time to hear your story. Present your sales story, filled with factual statements and leading directly to the point you want to make about your product.

"Remember also that, unlike the reader of a popular magazine who is looking for relaxation, when your prospect picks up his business paper he is mentally hanging out a sign, 'Help Wanted.' He's not reading these pages for entertainment but he's seeking just one thing—help in meeting his work-a-day problems.

"The industrial copy writer who rings the bell is the one who is willing to devote the time and effort necessary to prepare copy with this appeal, copy that is helpful, informative, that answers the prospect's questions, How, What and Why."

As you read the maufacturers' messages for you in the advertising pages of this and succeeding issue, how many of them measure up to these high standards; how many of them satisfy your needs? Your comments will be helpful to our advertisers as well as ourselves.

Yours sincerely,

Elmer T. Howson

ETH:GP

Editor

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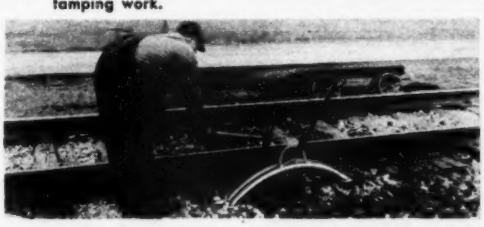
BUDA

RAIL BENDER

Below: BUDA Tie Nipper, time-saver on spiking and tamping work.

Above: BUDA Track Liner speeds up aligning jobs.



THIS *one-man* TOOL BENDS RAIL COLD!

• The only one man hand-operated bender that will bend 151-lb. rail cold, the BUDA Rail Bender is safe, simple and easy to handle. Stock rail and guard rail bends can be made in the field — a real time-saver! Write *now* for the Buda Rail Bender bulletin.

THE BUDA CO.
Harvey (Chicago Suburb) Illinois

PUSH CARS

JACKS
for every purpose

MOTOR CARS

Maintenance of way
EQUIPMENT

ENEMY AGENTS AT WORK?

No, just negligence! Rough and rutted aisleways and platforms hamper our war effort. Your own handymen can do an efficient, lasting repair job with tough, resilient, spark-proof STONHARD RESURFACER.

One clip of the scissors will bring you further information

I want descriptive folders on STONHARD RESURFACER.

Please send them immediately.

Name .....

Title .....

(Please attach to your company letterhead)

STONHARD CO.

1323 CALLOWHILL STREET

PHILADELPHIA 8, PA.

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

NOVEMBER, 1943

Editorials - **845**

Maintenance—Fighting Snow—Post-War Opportunities—Boys

Unit Tampers Become Valuable Part of Section Equipment on Mo. Pac. **848**

Tells how these units are used, maintained, overhauled and carried about by the different gangs on the two parts of this system

Converts Narrow-Gage Line to Standard Gage - - - - - - **852**

This article describes how the Colorado & Southern made this change-over on 14 miles of mountain railroad, high up in the Rockies

Installs Timber Foundations Under Heavy-Duty Crossing - - - **854**

Describes design and fabrication of continuous, resilient-type support under crossing on the Baltimore & Ohio, at Philadelphia, Pa.

Bridge and Building Section - - - - - - - - - - - - **855**

Report of two-day, war-time conference of the American Railway Bridge and Building Association, October 20-21, including the following:

Maintenance Essentials in War—by H. R. Clarke
Car Supply As Affected by Maintenance of Way Operations, by W. C. Kendall
Materials—Possibilities of Relief Through Substitutes
Securing Maximum Utilization of Work Equipment
Working Practices to Eliminate Interference with Traffic
Men—How to Secure and Hold
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Carrying Over Bridges and Trestles
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Programming Maintenance
Conserving the Ice Supply
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Tie Inspection Practices
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Operation of Valves
Preparing Yards for Winter

Products of Manufacturers - - - - - - - - - - - - **892**

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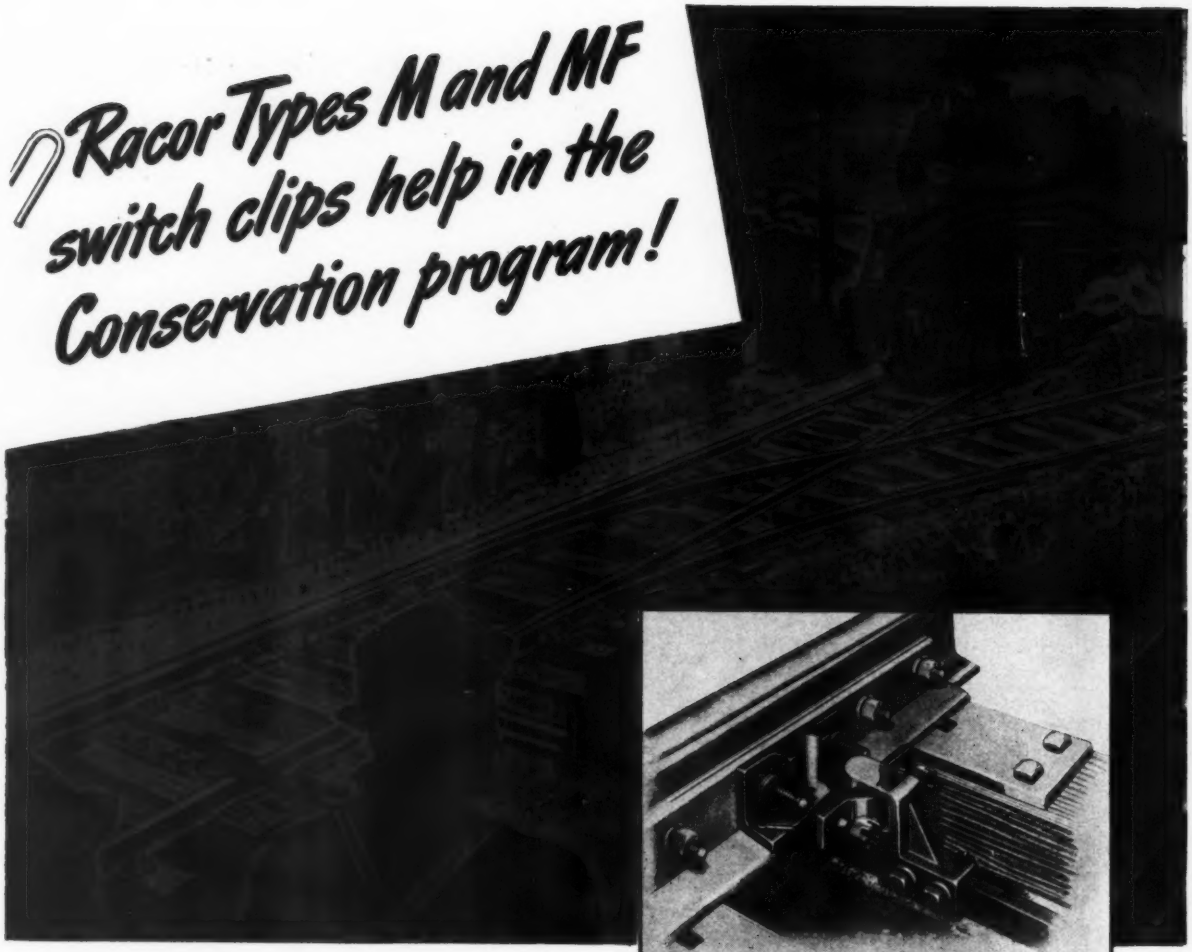
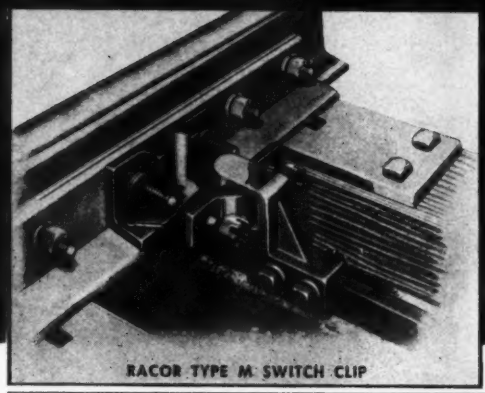
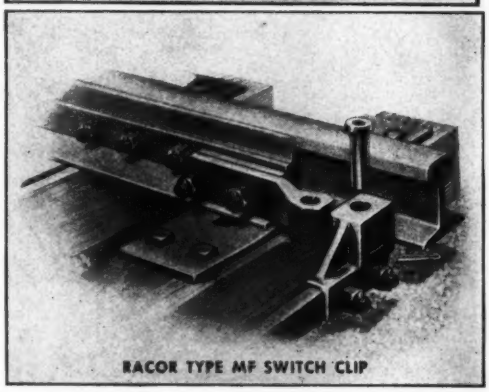
Racor Types M and MF switch clips help in the Conservation program!





RACOR TYPE M SWITCH CLIP



RACOR TYPE MF SWITCH CLIP

By providing free swiveling and easy operation and by preventing rolling of points, Racor Types M and MF Switch Clips help not only in the metal conservation program by increasing the life of points, but in reducing track and switch maintenance.

Installations of Types M and MF Switch Clips on high rails meet the most rigid tests, even after three years of most severe service. Correct point position, with respect to stock rail, is assured and point bearings can be tightened to rails without affecting action. They are particularly recommended for power-operated switches.

Ask our representative to explain how Racor Types M and MF Switch Clips insure long life of switch points and minimize valuable maintenance time.

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RAMAPO AJAX DIVISION

230 PARK AVENUE — NEW YORK, N. Y.

3228

AMERICAN Brake Shoe COMPANY

Railway Engineering and Maintenance

Maintenance—

Financing Work Now Deferred

Every car and locomotive exacts a toll from the tracks and structures over which it passes. This toll must be made good if the integrity of the property is to be maintained and dependability of service insured.

In 1918, the peak year of the first World War, the railways collapsed under a traffic load aggregating 405 billion ton miles of freight and 43 billion passenger miles. In 1943 they will handle approximately 87 per cent *more* freight and 90 per cent *more* passenger traffic. Expressed in another way, the railways will render more freight and passenger service during the present year than in 1918 *and* 1939 combined. Furthermore, it is now estimated that freight traffic will be six per cent and passenger traffic 15 per cent heavier next year.

Such traffic wears down roadway and structures more rapidly than ever before experienced. It constitutes a measure of the amount of work that confronts maintenance officers today. Under more normal conditions it would also constitute a measure of the magnitude of their working programs, especially in view of the fact that sufficient money is available today to meet all legitimate maintenance needs.

However, the railways are now unable to secure either materials or labor in adequate quantities to meet their needs. Early in the program of national defense, the enlarged demands of our armed forces made many materials unavailable to the railways. Similarly, the entrance of some two hundred thousand railway employees into our armed forces and other hundreds of thousands into defense and other industries have reduced railway forces so far below the needs that in many areas labor is not available to install even the depleted supplies of materials that are being received. As a result, the properties under the jurisdiction of the maintenance of way department are wearing out faster than their service life is being restored. This deficiency in roadway and structures alone will exceed $250,000,000 in 1943, and it is accumulating every day.

This deficiency in roadway repair constitutes a serious problem for the railways. Since they cannot now secure either the materials or the labor necessary to make good this deterioration, it is only ordinary prudence to lay aside the money necessary to do this work in order that it may be available when materials and labor again become available. This the railways have endeavored to do and the Interstate Commerce Commission has recognized the wisdom of this procedure by authorizing the roads to treat as current expense such sums as may be set aside now for maintenance work in the future. Present tax laws, however, recognize as operating expenses only those expenditures that are actually made. As a result, these deferred expenditures are regarded by tax laws as present net profits on which income taxes must be paid.

This procedure reacts to the serious detriment of the railways because income tax rates may range as high as 81 per cent. This may require a railway to lay aside as much as $5.26 to insure that, after taxes are deducted, $1 may be left for this deferred maintenance. This penalty is so severe as to preclude most roads' setting up reserves for maintenance. As a result, funds may not be available after the war to restore the wear and tear now being incurred. Also, it may be impractical to finance the employment which might thus be created.

This is a situation which the railways are endeavoring to correct through revision of the tax laws. It is of very direct concern to every person interested in the proper maintenance of the railways' fixed properties—to none more so than to those employed therein.

Fighting Snow—

Prospects Not Encouraging

PROBABLY no phase of the present acute labor shortage is giving maintenance officers in northern areas more concern at the moment than that of keeping their terminals open during the coming winter. Even under normal traffic this would be extremly difficult with the few men that most roads are able to muster in terminal areas. Keeping switches and interlockings in operation and large yards free of snow is a man-size job even when labor is abundant; doing this for a war-time traffic that will condone no delay, with depleted forces and no prospect for increasing these forces or obtaining outside help, may become an impossible task.

So far as main-track movements are concerned, interlockings are most vulnerable during snow storms. They may give trouble even when the snow fall is light, especially if it is accompanied by wind, but their vulnerability increases rapidly as precipitation becomes heavier. Interlockings generally control several routings, all of which may be tied up if the interlockings become inoperative. If it is at the crossing of two or more roads, it is possible for all of the traffic on these lines to be interrupted until the plant is restored to operation. It makes little difference, so far as the movement of traffic is concerned, whether these interruptions result from lack of men or the severity of the storm, for in a busy terminal the movement of all traffic can be stopped by the failure of a single interlocking.

Difficult as it frequently is to keep interlockings open, the heaviest task in a severe snow storm falls to those who must keep freight yards and other freight facilities clear of snow and ice. Every switch on a ladder must be given constant attention, and slip switches add disproportionately to the burden of the snow-fighting forces. Where gravity switching is done, all of the problems of the interlocking are presented by the hump and classification switches, while the car retarders impose a special complication.

Engine terminals, passenger terminals, stations and station platforms, team yards, freight houses, drawbridges, industrial leads and switching tracks, and many other facilities present problems peculiar to themselves. When the storm is over and traffic has been restored to something like normal, disposition must be made of the piled-up snow or the next storm may completely paralyze every operation.

Although snow-melting equipment, flangers, spreaders, clamshells, weed burners and other mechanical aids, if available, can be used effectively to supplement manpower, more than the normal maintenance forces are needed for the tasks that have been enumerated, and there are others as essential. In previous years, the railways have been able to obtain the additional help they required from outside sources. This year, with already depleted forces, in some cases as low as 40 per cent of normal, there is no outside pool of unemployed from which they can draw to obtain this help.

Men engaged in fighting snow are subject to severe exposure and must be relieved at intervals for rest and recuperation, if the storm is long continued. With less men than are required for the initial operation, the railways are without the reserves necessary to provide this relief. The prospects for the coming winter are, therefore, not encouraging, and, if the winter is a severe one, maintenance forces will be taxed to the limit if important military traffic is to be free of severe delays.

Post-War Opportunities—

to Apply Lessons Learned Today

ALTHOUGH maintenance officers consider that labor is the most acute problem which they face, they are frank to say that material is second by only a narrow margin, and they are indicating a growing concern over their ability to meet the demands that are being made on the tracks and structures that are in their charge, unless more materials of certain classes are made available to them. This concern was clearly in evidence at the war-time conference of the American Railway Bridge and Building Association, a full report of which appears in this issue, and at the meeting of the Maintenance of Way Club of Chicago later in October.

It may well be recognized at the outset that many of these restrictions will be continued, or relaxed only slightly, and that there is no profit in wishing for materials that will not be available. In this situation it will be necessary to utilize second-hand material to the limit of its availability, and to turn to substitute materials or materials that are not on the critical list. Obviously, the supply of second-hand materials is not inexhaustible, and much of them are not suitable for some of the purposes for which materials are needed.

On the other hand, under the stress of necessity, the ingenious officer will find opportunities where, by making certain changes in existing structures or in designs for new ones, it will become possible to use a second-hand item or a substitue instead of a critical material, and still have a structure that will perform all of the functions for which it was built. Such action will reduce the demands that are being made constantly for critical materials and thus make it easier to get them for purposes for which substitutes cannot be used.

The situation is not without its compensation, however. During the years immediately preceding the war a wide variety of new materials, especially for buildings, were developed, and they were only beginning to be introduced into the railway field when the outbreak of hostilities caused a suspension of those activities in which they were finding an application, so that many officers have not used them or seen them used. Therefore, if they are alert and ingenious, and find opportunities to use them, they will become familiar with their merits through actual experience with them.

It should not be overlooked that when the war ends, the railways will again be in competition with other forms

of transportation, some of which will probably be greatly expanded. Today, the crying need of the railways is for facilities of sufficient capacity to handle an extraordinary traffic that has been thrust upon them. In the post-war period they will have to fight for much of what they get, and modern, efficient facilities that will enable them to attract business and expedite its movement will be essential.

Since railway structures are not only performing more service, but are being subject to more severe wear and tear today than ever before; since, as a whole, they are of necessity being under maintained; and since the new conditions that will arise in the post-war period will make most, if not all, of them obsolete, many of these structures, including both bridges and buildings, will be remodeled, replaced or thoroughly overhauled. For these reasons, modernization will be the keynote of all of these activities, and many of the lessons that are being learned under the stress of stringency and substitutions will stand those in good stead, who are willing to learn from today's unpleasant experiences.

Boys—

Demonstrate Value in Wide Range of Work

WHATEVER maintenance of way officers may have thought eight or ten months ago about the practicability of employing boys below selective service age in track work, they must admit now that, given proper working conditions and supervision, these boys proved to be a great asset on many roads during the last summer. Everywhere the report is the same—on the Milwaukee, the Northwestern, the Soo, the Katy, and others—that the boys accomplished a large amount of necessary work that could never have been done without their aid; that they applied themselves diligently, showed a high regard for safety, and demonstrated unusual aptitude and skill in the use of power tools and machines.

Now that the railroads and the American boy have become better acquainted—understand each other's problems better—what are the prospects for their wider utilization in railroad work during the next working season? Indeed, what are the prospects of employing them at every opportunity, week-ends and vacation periods, during the remaining weeks this fall and the coming winter months? The answer to these questions is entirely up to the railroads, and what the railroads do, in many cases, depends largely upon the imagination, initiative and ingenuity of their division maintenance officers in encouraging the employment of boys on their respective territories and in organizing work for them to do. It is no longer a question of finding necessary work to be done, but rather one of so organizing the procedure for such work that it can be done by boy crews, even on a part-time basis, if necessary.

In areas of moderate climate, carrying out certain classes of track work by boy gangs week-ends should present no serious difficulties. In the North, where winter conditions will bring most track operations to a standstill, boys may prove invaluable in storm emergencies, if arranged for in advance; indeed, they may prove the only recourse for such emergencies in many critical areas where the normal sources of labor have completely dried up.

Going beyond the employment of boys in the track department, there is an almost untouched field for their use in the bridge, building and water service departments, where the problem of labor shortage is growing more serious daily. It is recognized that the possibilities in this field are more limited, both as to the scope of the work on which boys can be employed effectively and the number of vacancies to be filled, but just so long as the railroads continue to report a shortage in bridge, building and water service men in excess of 4,000, as they have in recent months, the opportunity to employ boys of suitable capabilities in bridge, building and water service work should not be overlooked.

A number of roads with experience in the employment of boys have found them especially adept in painting work and in a wide range of helper operations. On one road, a crew of 25 boys made extensive installations of pipe lines at a terminal during the last summer, work that could not have been done if it had not been for them.

With the railways in such dire need of additional workers, and with boys under selective service age about the only remaining source of labor in the country, maintenance officers will make a serious mistake if they do not utilize the possibilities in this regard to the fullest extent. To this end, they must establish and maintain contact with school authorities, planning far in advance to utilize the boys wherever and whenever they can be employed effectively. Both stand to gain—the railroads and the boys themselves. As W. G. Powrie, engineer maintenance of way, Chicago, Milwaukee, St. Paul and Pacific, said in an address before the recent conference of the American Railway Bridge and Building Association. "While we all deplore the conditions which make the use of boys 16 and 17 years of age so important to us at this time, we can take satisfaction in the fact that by providing healthy, muscle-building, outdoor work for them, we are training some of the world's finest football teams of the future, and, even more important, we are accomplishing much needed work on the railroads and are training a grand lot of railroad men for the future."

A Tribute Well Deserved

"We will appreciate it if you will express to the men and women who work on America's railroads the gratitude of the Army and Navy for the splendid job they are doing.

"Since the outbreak of war the railroads have hauled 76 million carloads of freight, most of it destined for battle fronts. Millions of fighting men have been transported to training camps and embarkation points. To the men and women who have made this record movement of men and weapons possible, the Army and Navy are deeply grateful.

"Keep up the good work—for railroad work is war work, railroad service is vital to victory."

Robert P. Patterson
Under Secretary of War

James Forrestal
Under Secretary of the Navy

Unit Tampers Become Valuable

During the last three years, the Missouri Pacific Lines, North, and in Texas, have been steadily increasing the use of unit, self-contained tie tampers by their section forces, until today more than 350 gangs on these lines have been furnished with such tampers, primarily for routine spot surfacing work. The manner in which the units are used, maintained, overhauled and carried about by the gangs is discussed in this article

The Unit Tampers Are Used Generally for Spot Tamping, but Have Been Bunched for Out-of-Face Surfacing

THE Missouri Pacific Lines are demonstrating that unit, self-contained power tie tampers have a definite place in the hands of section gangs for routine spot tamping and minor surfacing operations, and are effective in increasing production and in improving the quality and permanence of the work that must be done by these forces. Beginning with a few experimental units in 1940, these lines have now equipped each of more than 350 section gangs with two of these tampers as standard equipment. In certain territories, the tampers are used almost daily to some extent by most of the gangs, and, in fact, on the lines in Texas and Louisiana it is required that the section gangs take their tampers with them every day that they expect to be engaged in track work.

Out of the experiences of these lines, North and South, many special practices have been set up and many facts have been learned—dealing with such matters as the instruction of foremen and laborers in the operation and routine maintenance of the tampers; charging the batteries employed with them; the type of lubricated fuel best adapted to their use; the reconditioning of the tamper bars and the periodic overhauling of each tool as a whole; and methods of carrying the units to and from work. All of these will be discussed in this article.

Of the tamper units now in service on the Missouri Pacific, 274 are on the lines in Texas and Louisiana and 460 on the lines North. A significant feature of their use on the lines in Texas is that practically all of the main-line sections on these lines are now equipped with them. Supplementing the two tampers furnished each section, which are always employed together in tamping operations, the equipment furnished each section includes a 6-volt, 120 ampere-hour storage battery with 25 to 50 ft. of cable for supplying ignition to the tamper engines, and a small battery-charging outfit, installed in the section tool house, by means of which the battery is recharged once or twice a week as required.

Lines in Texas and Louisiana

On the Missouri Pacific Lines in Texas and Louisiana, whose practices in the use of unit tampers will be discussed first, the tracks are ballasted largely with pit-run gravel, generally a 60-40 mixture of stone and sand. However, there is a considerable mileage of crushed stone ballast on those lines carrying the heaviest traffic. To meet this condition, two types of tamping bars are furnished with the unit tampers, one with a ¾-in. by 3-in. flat head for use in stone, and the other with a ¾-in. by 5-in. saw-toothed head for use in gravel. Sections in this territory average slightly more than 12 miles of single track, and the section force normally consists of a foreman and five laborers.

Careful Instruction Given

In supplying the sections with power tampers to replace picks and bars, the greatest care has been exercised to instruct the foremen and their men in the proper operation of the tools. In addition, each foreman has been shown how to dismantle and overhaul the tampers, which he is required to do at intervals of approximately sixty days to secure their most efficient operation.

To insure that these measures are carried out, it is a practice for a work equipment man to visit each section as it is furnished tampers, to instruct the section foremen personally in their use and upkeep. At this time, one of the machines is completely dismantled and the foreman is instructed regarding the pur-

Part of Section Equipment on the Missouri Pacific

pose of each part and is shown how to adjust and reassemble it. He is also shown how to recharge and otherwise care for the battery furnished; how to transport the tampers, and, in fact, all of the "tricks" that have been learned through earlier experience to get the most effective use out of the units. Education, therefore, has been one of the cardinal principles in the plan of equipping section gangs with power tampers, and to this is attributed in large measure the ready acceptance of the tools by the section forces and the continued success that has attended the expansion of their use.

Largely Spot Tamping Work

As already indicated, the unit tampers are employed primarily in spot tamping, particularly in picking up low joints and in tamping new ties following renewals. General out-of-face surfacing work following rail renewal and ballasting operations is generally done with multiple-unit electric or pneumatic power tampers, as will be mentioned later. However, by combining two or more sections with their unit tampers, out-of-face surfacing with a light lift has been done at times with these self-contained units with equal success. In neither type of tamping has it been found necessary to remove any of the ballast from the cribs, as the tamping bar of the tamper readily works its way down through the ballast to the bottoms of the ties. Furthermore, the tampers will lift the ties up solidly against the rail without the aid of tie nippers.

Specific tests and routine experience on the lines in Texas and Louisiana have demonstrated that the tampers double the overall production per man-hour over bar or pick tamping, and that the resulting work is more uniform and will generally stand up considerably longer. Experience has also demonstrated that when the section forces become accustomed to the power tampers, they prefer them to hand tamping and are not willing to give them up.

The lines in Texas and Louisiana use a mixture of gasoline and oil for the operation of unit tampers, the oil content being one-half pint of SAE-70 oil to the gallon. This is the same mixture of fuel that is used in motor cars on these lines, and thus eliminates the necessity for section forces keeping two fuel mixtures on hand.

Portable Battery Chargers

The sections that are without ready access to signal current are equipped with small portable charging sets for recharging the storage battery that forms a part of the unit tamper equipment, which operation is necessary once or twice each week, depending upon the number of hours the tampers are worked. These sets, which consist of a ⅜-hp. Briggs & Stratton gasoline engine and a 6-volt generator, are given permanent support on a rack attached to the inside of one of the sidewalls of the tool house, the rack being large enough to support the battery during charging operations. Where this equipment is used, charging is done at night over a period of four to six hours, the amount of the charge being gaged by the charge remaining in the battery at the time it is put on the line, and being governed by the quantity of gasoline that is put in the charger engine fuel tank.

In automatic block signal territory, where electric current is readily available, sections have been equipped with rectifier chargers in place of the engine charger sets, these rectifier chargers generally being located at a signal relay case or other convenient point.

This View Shows How the Unit Tampers Are Carried to and from Work on Motor Cars on the Lines in Texas and Louisiana

Some Sections Periodically Pour a Little Solvent Into the Exhaust Port of Each Unit

Throughout their experience with the unit tampers, the lines in Texas have had uniformly successful operation of the tampers, but much of the success that has been attained, especially as to uniform power output of the machines and minimum maintenance of the tamper engine units, is attributed to the frequent use of a solvent to keep the engine head, rings and ports free from carbon, and to the 60-day overhaul program that is required on the part of each section foreman. The solvent, which was developed by one of the oil companies, is employed in the tampers daily, and in some cases, depending upon the use of the tampers, twice each day. Normally, about two ounces of the solvent are poured into the exhaust port while the machine is turned upside down on the rail or other clean surface, and while the starting lever is pushed down, allowing the liquid to enter the engine cylinder. The solvent should be put in the tamper when the engine is hot, either at noon or at night, allowing the tool to stand idle for some time before being started again.

Maintenance and Repair

Through the use of this solvent, it is felt that more uniform power output is obtained from the machines, and the interval between periodic dismantling and cleaning of the units is lengthened to 60 days. Each 60 days, however, the foreman is required to dismantle his tampers completely, and to clean the various parts thoroughly. At the same time, he must check the condition of all wearing parts, renew the piston rings if necessary, and also check the tension in the engine spring. Depending upon the skill and ability of the foreman, this complete overhaul can be completed in from 30 minutes to an hour. All of this is done directly at the tool house, usually during a period when weather conditions prevent work on the track, and requires only the simplest tools which are furnished with the machines.

Supplementing this regular periodic check of the tampers by the foremen, roadway machine maintainers inspect the units when making their periodic check-ups of all roadway machines. At these times, these men discuss the operation and condition of the tampers with each foreman and make any repairs that are beyond his skill or ability. Only in the most unusual cases has it been found necessary to send any of the tamper units to the central reclamation plant at Palestine, Tex., where the heavier roadway machines are overhauled.

Owing to intensive use, one part of the tampers that requires repeated attention is the tamping bars, the heads of which become rounded and worn back through constant abrasion against the ballast. To recondition these bars as they become worn, and, in fact, improve their wearing quality, they are sent to the reclamation plant where the tamping heads are rebuilt to standard section by welding. In this operation, the full section of the head is first restored, employing a mild steel rod, and then the wearing surfaces of the head are coated with a 1/16 in. to 1/8 in. layer of Studite, a self-hardening, abrasion-resisting steel. Thus reconditioned, the bars give from two to three times the service life of new, untreated bars before further reconditioning is necessary.

Method of Carrying Tampers

Under standard instructions on the lines in Texas and Louisiana, the section forces are required to take their unit tampers with them daily, except when they do not expect to be engaged in track work, so they can give proper attention to low joint conditions or other minor surface irregularities found. The standard method of transporting the tampers on a section is to hang them on the rear safety rail of the section motor car. In this, the two tampers are hung upright, side by side, their weight being carried in each case by the forward tamper handle, which is hooked over the safety rail. In this position, with the tamper bar in each case extending down between the rear end sill and the lift pipe across the end of the car, the tampers are tied together and to the safety rail to prevent their falling off, and are separated by a piece of old tire carcass to prevent abrasion.

The method of securing the tampers in position involves merely a piece of rope or strap about 4 ft. long, which is permanently tied about the end of the center safety bar, near the rear end rail, with two free ends each about 20 in. long. In securing the tampers in place on the car, these free ends are passed through the front handles of the tampers and are then tied together with a bowknot, which can be released quickly when desired.

While the tampers in this position add to the lifting weight of the rear end of the car, this is offset to a large extent by the provision made on all section cars on the Texas lines for an extension lift handle. This arrangement involves a 2-in. pipe fixed longitudinally under the center line of the car frame, into which the end of a standard lining bar can be placed to form an extension lift handle, long enough to be grasped conveniently by two men.

Lines North

On the Northern lines of the Missouri Pacific there are now 460 power tampers of the self-contained

Many of the Sections Are Equipped with Small Battery Charging Units

type in the hands of section gangs, two to the gang, as on the lines in Texas. The practices generally as to the operation and maintenance of the machines parallel those on the Texas lines, but differ in a number of respects. Here, where the tampers were first furnished to those sections with stone ballast, and subsequently to those with gravel ballast —with a considerable number of sections still not equipped—they are employed solely for spot surfacing work, out-of-face surfacing being done by extra-gang forces equipped with multiple-tool electric tamping outfits.

Aside from this detail, and the fact

that all section foremen are carefully instructed in the use and maintenance of the tampers as they are furnished them, the practices followed in the use of the unit tampers are slightly more flexible on the Northern lines than on the Texas lines, both as to operation and maintenance. In the first place, there is no rule requiring that the section forces carry the tampers with them on all days when they expect to do some form of track work, the matter of when the tampers will be taken out on the job being left to the discretion of the individual foremen, beyond the point of assurance that each foreman is employing his tampers effectively and to the fullest possible extent. Likewise, the foremen are required to keep their tampers in good operating condition, overhauling them as necessary to this end, but there is no set period for overhauling, this being left to the judgment of the foremen and machine maintainers, and varying from less than 60 days to more than 60 days as conditions dictate. All major repairs to the tampers, which have been extremely uncommon, are handled in the reclamation plant of the Northern lines at Sedalia, Mo.

Special Fuel

The Northern lines use a somewhat different tamper fuel from that used on the Texas lines. This fuel is a compromise between the diverse requirements of the tampers, motor cars and other roadway machines. For general use in the two-cycle engines employed by the maintenance forces on these lines, the stores department furnishes a gasoline-oil mixture consisting of 80 gal. of SAE-40 oil to 1,000 gal. of gasoline, and the section forces always have a supply of this fuel on hand. To this mixture, which amounts to a little more than one-half pint of the SAE-40 oil to the gallon of gasoline, further oil is added for tamper operation. Each foreman is furnished a five-gallon can of SAE-80 oil, and he adds from one-quarter to one-half pint of this oil per gallon of the standard gasoline mixture furnished, the exact amount depending upon the results obtained in the operation of his tampers.

Whether the mixture of fuel used is a factor or not, it is a fact that on the Northern lines there is considerably less use of a solvent to keep the tamper engines clean and free-running. Some section foremen use a solvent in the tamper engines from time to time, and feel that it improves performance, but others secure satisfactory operation without the use of a solvent of any kind.

A part of the unit tampers on the Northern lines are provided with magnetos, and, therefore, require no batteries for ignition. The majority, however, are equipped with 6-volt, 120 ampere-hour storage batteries as on the Texas lines. Likewise, many of the sections are equipped with portable, gasoline-operated battery charging sets. However, with much more automatic signal territory on the lines North than on the lines in Texas, nearly 75 per cent of the battery charging on the lines North is done by means of rectifier chargers, placed in the signal circuits, either at the tool houses or at signal relay cases. Not infrequently a single charger has been found adequate to the requirements of two sections where the tool houses on these sections are close together, or where the same signal circuit is equally convenient to both sections.

Other Practices

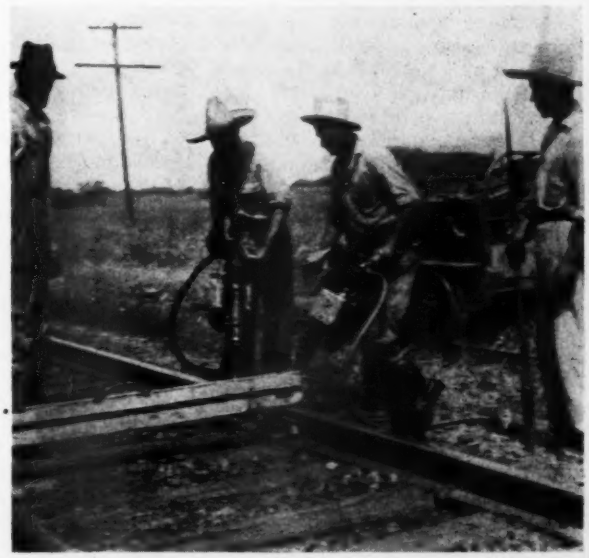
Worn tamping bars are built up on the Northern lines, first to full section by gas welding, generally employing the M.W. rod of the Oxweld Railroad Service Company, followed by the application of a 1/16-in. hard-surface coating, applied by arc welding. This abrasion-resisting coating is applied on the end and all faces of the tamping head, except the front face, where wear is a minimum.

Carrying this latter practice further, the tamping heads of all new bars are also coated with the hard-surface rod material before they are put in service, to lengthen their initial service life. All of this work, both on used and new bars, is done either at the reclamation plant of the Northern lines at Sedalia, or on those divisions which have suitable welding equipment.

No standard practice has been set up on the Northern lines for carrying the tamper units to and from work, some gangs carrying them on standard push cars and others on special light-weight push cars furnished for the purpose. However, to overcome the disadvantages in the use of push cars, increasing use is being made of two specially-designed hangers mounted on the rear of the motor car, attached to the safety rail, which take the weight of the tampers off their handles and, at the same time, by means of lock bolts, hold the units in place securely without the use of straps. The hangers also permit the ready removal of the tampers, simply by releasing the bolts. This, it is felt, is advantageous to lighten the weight of the car and the lift required, when removing it from the track.

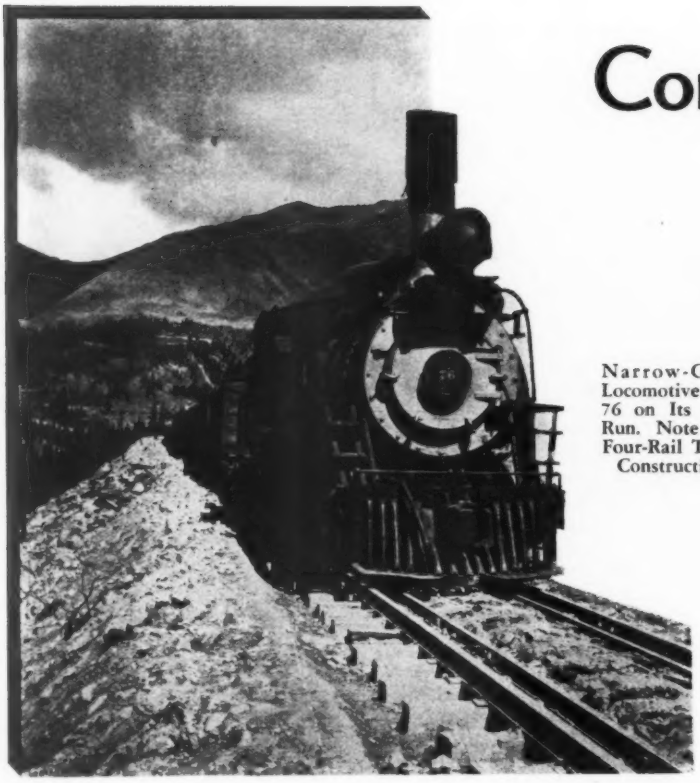
Out-of-Face Surfacing

For out-of-face surfacing, both territories of the Missouri Pacific are making increasing use of multiple-tool power tampers, largely of the electric vibrating type. At the present time, the Northern lines, on which practically all such general surfacing operations are carried out with this equipment, have 27 four-tool and 43 eight-tool electric tamper outfits. The Texas lines, on the other hand, have 9 four-tool electric outfits and 2 eight-tool and 7 four-tool portable pneumatic outfits, the eight-tool machines having crawler mountings. Eight additional four-tool electric outfits are on order.



A Typical Main-Line Section Gang on the Lines in Texas and Louisiana, Practically All of Which Are Equipped with Two Unit Tampers

Converts Narrow-



Narrow-Gage Locomotive No. 76 on Its Last Run. Note the Four-Rail Track Construction

On August 25, the Colorado & Southern operated its last narrow-gage train over the 14-mile line between Leadville, Colo., and Climax—24 hours later the line was ready for standard-gage operation. The change-over was made with a minimum of interruption to traffic, so that shipments of molybdenum concentrate would not be delayed.

FOR some time, the Colorado & Southern (part of the Burlington System) has faced the problem of increasing the capacity of its narrow-gage line between Leadville, Colo., and the important Climax Molybdenum Company mine on the Continental divide at Climax, Colo. The capacity of this line, which is 14.06 miles long, was limited by the low tonnage rating of the narrow-gage locomotives and by the necessity of transferring the sacks or barrels of molybdenum concentrate by hand from the narrow-gage to standard-gage cars at Leadville, from whence they were routed to their destination via standard gage lines. Supplies inbound to the mine were also transferred from standard-gage to narrow-gage cars at Leadville by hand or crane.

The problem of increasing the capacity of this line was one of widening the gage, permitting the operation of more powerful standard-gage locomotives and eliminating the costly transfer operations which also caused a 24-hr. or longer delay for both incoming and outgoing freight. In addition, the volume of freight had increased to such an extent that it taxed the capacity of the transfer facilities and soon after Pearl Harbor it became apparent that the capacity of the line was inadequate.

The Leadville-Climax line of the C. & S. has a maximum grade of 2 per cent, except in the yard at Climax, and a maximum curvature of 20 deg. It ascends from an elevation of 10,207 ft. at Leadville to an elevation of 11,324 ft. at Climax, rising on a 2 per cent compensated grade nearly all the way. The line is located on the steep mountain slopes, following the East fork of the Arkansas river to Climax at Fremont pass on the Continental divide. Indicative of its mountainous location, it includes 123 curves with 2,874 deg. of curvature, or an average of 204½ deg. of curvature, per mile. The line has one curve of 20 deg. and 44 curves of 15 deg. Because of the curvature, the speed limit is 15 m.p.h.

The nature of the line prohibited any consideration of relocation or grade reduction. This simplified the problem to one of widening the gage of the line and of the tracks in the yards at both ends, and making changes in the terminal facilities at Leadville for the operation of standard-gage locomotives.

It was decided in the spring of 1943 to do this work during this summer. Because of the importance of the mine shipments to war production, it was also decided that service must not be interrupted longer than one 24-hr. period when the change was made from narrow to standard-gage operation. This, in effect, would offer no delay to outgoing shipments of molybdenum concentrate because the normal 24-hr. delay caused by the transfer operations would be eliminated at the same time.

General Plan of Work

The summer season is short in these high altitudes and for that reason the work was begun as early as May 1, with an extra gang starting from Leadville to insert 8-ft. ties. Not all of the ties had to be changed out, because, in anticipation of this work, all tie renewals had been made with 8-ft. ties for several years. A total of 20,200 ties were inserted in the line this season, of which 3,678 were new and the rest were second hand, secured from an abandoned branch line in Texas. In addition, 6,500 ties were inserted in tracks at the mine. When the longer ties had been inserted on about half of the line, a second extra gang was started on July 4, laying rail to standard gage, with one rail on each side outside the narrow-gage rails. The rail laid was second-hand 75 and 85 lb., rerolled to about a 67-lb. section. The old narrow-gage rail varied from 40 to 56 lb. The new rail was unloaded by hand, but was laid with a standard-gage rail laying machine that had been converted to narrow-gage for this particular job. All ties were fully plated under the new rail, whereas formerly only the curves were plated.

Gage Line to Standard Gage

Without Interruption to War Traffic

As soon as considerable standard-gage rail was laid, a standard-gage locomotive with two steam ditchers, a Jordan spreader and four air-dump cars were shipped to Leadville for ditching and bank widening work. The ditchers began work the latter part of June. They have worked nearly every day since and are still working. They have averaged 600 cu. yd. or more daily and have moved approximately 70,000 cu. yd., to date. This train was also used to distribute materials, etc. In addition, about 30,000 cu. yd. of ditching and bank widening was done by contract with a Diesel shovel and bulldozer. The ditching was done not only to improve drainage and strengthen the embankments at weak points, but also to ease the problem of snow removal, a big factor in the operation of this line from September to June.

After the line was widened, it was necessary to relocate the wye tracks at Leadville and Climax to permit turning the standard-gage locomotives. Both wyes originally had a curvature of 32 deg. The wye at Climax was reconstructed with a curvature of 16 deg. on one leg and 16 deg. 30 min. on the other leg and that at Leadville with a curvature of 18 deg. The most important yard tracks at both points also had to be widened before the change could be made. This problem was simplified at Leadville because one mile of main line and a siding were already laid with three-rails for both standard and narrow-gage operation. In addition to the main line, a total of 21,236 track feet of additional yard tracks were converted to wide gage. It was necessary also to install longer water spouts on the two wayside tanks and strengthen the bridges. One water tank was replaced and the old tank dismantled.

The 20 Deg. Curve on the Line Which Is Protected by an Inner Guard Rail. Extra Gang Bunk Cars Are in the Background

No. 6 Turnout, With Stub Switch, on the Wye at Leadville

The line includes four open-deck trestle bridges; a one-panel bridge with frame bents, a one-panel bridge with pile bents, a three-panel bridge with frame bents and a five-panel bridge with pile bents. The decks of these bridges were all wide enough for standard-gage track. These were repaired and additional outside stringers were installed to strengthen the spans for the standard-gage locomotives. Five culverts were lengthened to take care of the increased width of embankments. Small wooden culverts were replaced in kind because of their poor condition, and several were installed to take care of springs, wet spots in cuts, etc.

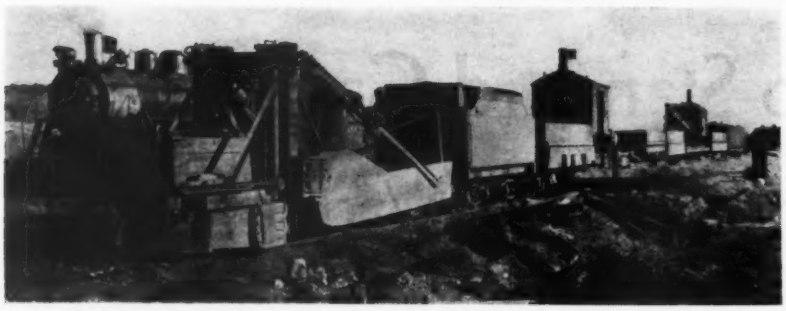
When the day for conversion arrived, all preparatory work that could be done had been completed and all that remained to make the conversion complete was the installation of standard gage switches in both yards and two crossings at Climax, after which the work of removing the narrow-gage rails and remodeling the roundhouse at Leadville was begun.

The switches on this line all have No. 8½ rigid frogs, except the tail track switch in the wye at Leadville which has a No. 6 frog. They are all stub switches because of the severe winter weather and heavy snows at these high altitudes, which make the operation of standard split switches extremely difficult.

The old narrow-gage rails were removed by pulling the spikes, barring the rail out on the shoulder, disconnecting the joint bars and loading it on flat cars with an air-operated rail loader and an Eagle crane.

Other Work

After the line had been converted to standard gage operation, a considerable amount of additional work was required at Leadville. The old turntable, a 50-ft. hand-operated balanced type, was removed. The six-stall narrow-gage engine-house was lengthened and revamped to provide three stalls and one drop pit to house two standard-gage locomotives and a rotary snow plow. The snow plow,



The Jordan Spreader and Ditching Outfit Used on This Work

which was a standard-gage rotary mounted on narrow-gage trucks, was remounted on standard-gage trucks. The new engines are also equipped with flangers and stub snow plows.

In addition to the terminal changes at Leadville, the narrow-gage equipment, consisting of 125 box cars, flat cars and gondolas, most of which had been sold, had to be loaded or scrapped and shipped away. The sides were torn off the narrow-gage coal cars and off some of the box cars, leaving only the decks. These were lifted off the trucks and loaded in standard gondolas. The narrow-gage box cars that were loaded intact were pulled directly from a narrow-gage track onto the deck of standard-gage flat cars which were spotted at the end of a standard-gage track depressed for this purpose.

Three Meco two-rail flange lubricators were installed on the line and the locomotives are also equipped with flange lubricators. Gage is maintained on sharp curves by the use of gage rods and by double spiking. The 20-deg. curve has an inner guard rail for its full length of 920 ft.

Labor Problems Hampered Work

Because winter begins about the middle of September at the high altitudes on this line, every effort was made to speed the work and get the line widened before winter. The gangs were worked 10 hours a day, seven days a week, all summer. The progress of the work was slowed up, however, by difficulty in keeping the gangs filled. An indication of this was the fact that the size of both gangs varied from 25 to 50 men and the average for each gang was nearer the lower figure.

The gangs were housed in new outfit cars and were fed well. At both camps, it was possible to pipe ice-cold spring water directly to the cars. There were several reasons, however, for the difficulties encountered in securing and holding labor on this work. In the vicinity of Leadville high wages were being paid by the Climax mine and the mines and smelter at Leadville. High wages were also being paid on the construction of an army base nearby. As a consequence, good labor was difficult to obtain or hold and, in addition, because of the high altitude many of the men could not stand the work. To add to the difficulty, weather conditions are bad throughout the summer in this locality, with local rains or snows nearly every afternoon. In spite of these difficulties, the work was completed on time. It is now believed to be the highest regularly-operated standard-gage railroad in the world.

This work was done under the general direction of Robert Rice, vice-president of the C. & S., E. P. Stine, superintendent; M. A. Stainer, assistant chief engineer; W. S. Broome, engineer maintenance of way, and R. F. Harris, roadmaster, all of Denver, Colo. R. E. Frazell, track supervisor, Ft. Collins, Colo., was in local charge of the work.

Installs Timber Foundation Under Heavy-Duty Crossing

IN recent years, the Baltimore & Ohio has installed a number of treated timber foundations under railway crossings, which are so designed that continuous support is provided under each rail through the crossing. Foundations of this type are considered by this road to be definitely advantageous in maintaining track surface, in reducing noise and vibration, and in prolonging the life of the crossing frogs.

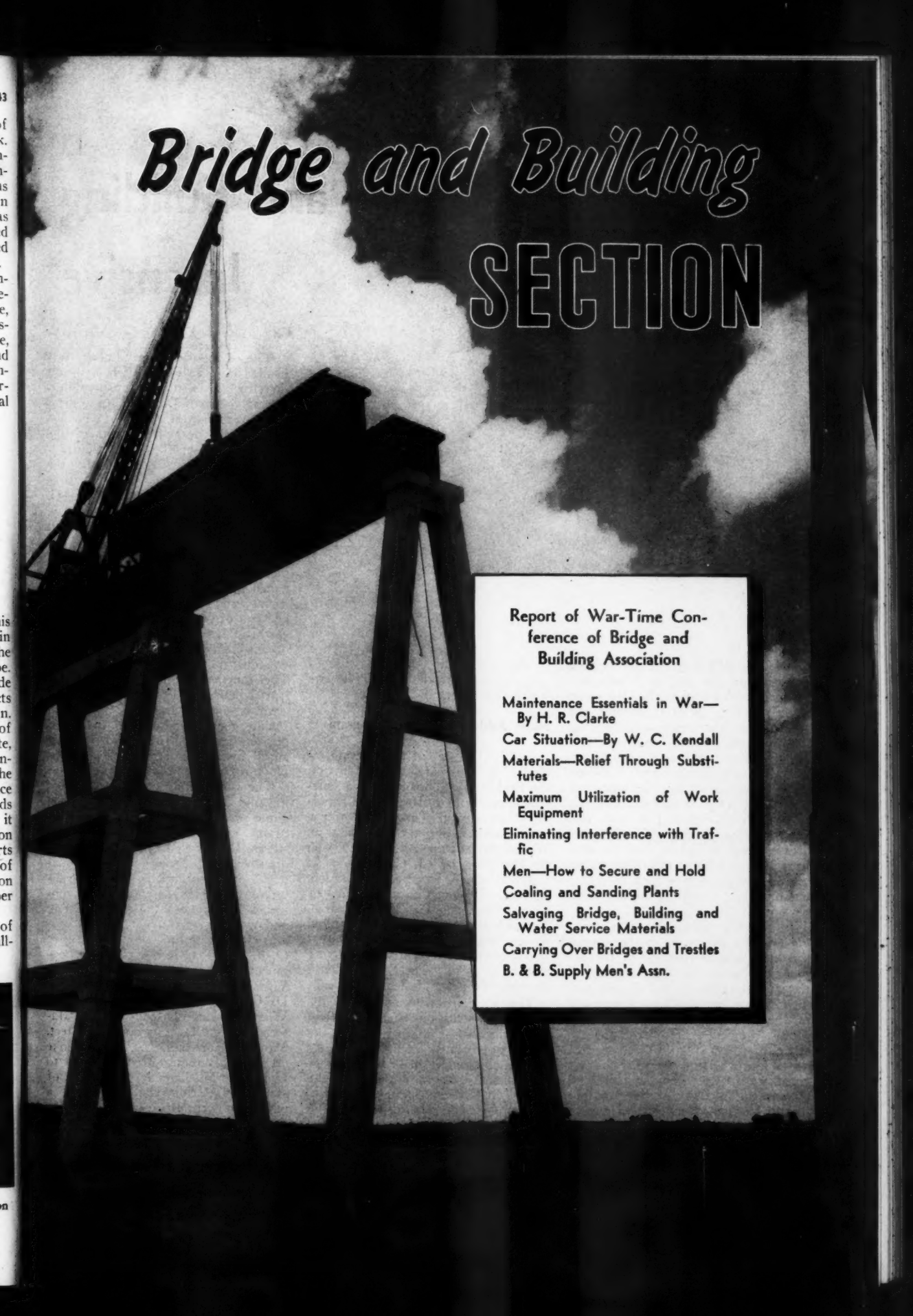
The latest crossing foundation of this type to be installed was inserted recently at an intersection of the main line of the B. & O. and a branch line of the Reading in Philadelphia, Pa., each line having two tracks at this point. Traffic over the B. & O. averages about 35 trains each way daily. The intersection is made at an angle of about 68 deg.

When it became necessary recently to replace the old crossing at this location, it was decided to install in its place an Asselin crossing of the permanent-base, rubber-cushion type. In this type of crossing, use is made of rubber pads to minimize the effects of passing traffic. One pad, ⅜ in. thick, is placed between the base of the rail and the top of the base plate, and another pad, ¼ in. thick, is inserted between the base plate and the top of the crossing foundation. Since the base plates and the rubber pads are continuous for the most part, it is necessary to provide a foundation incorporating continuous supports under the rails within the limits of the crossing. It was for this reason that a specially-designed timber foundation was installed.

The foundation is constructed of white oak timbers treated by the full-

(Continued on page 884)

The Foundation Assembled at the Framing Plant Prior to Treatment. The Bolts Laid on Top Show Locations of Connecting Bolts at Miter Joints



Report of War-Time Conference of Bridge and Building Association

Maintenance Essentials in War—By H. R. Clarke

Car Situation—By W. C. Kendall

Materials—Relief Through Substitutes

Maximum Utilization of Work Equipment

Eliminating Interference with Traffic

Men—How to Secure and Hold

Coaling and Sanding Plants

Salvaging Bridge, Building and Water Service Materials

Carrying Over Bridges and Trestles

B. & B. Supply Men's Assn.

Bridge and Building Intensive

Proper Planning of Bridge and Building Programs Is More Important Than Ever Before

CONSIDERING an annual meeting essential to the safe and adequate maintenance of bridges, buildings and water service facilities during the present war emergency—maintenance that is more difficult, and yet more essential than ever before—the American Railway Bridge and Building Association held a two-day war-time conference in Chicago on October 20-21, streamlined to the limit, and yet crowded throughout with addresses, papers and reports on subjects of vital interest to bridge, building and water service men in carrying out their work in these critical days.

In a number of respects, the meeting differed widely from the normal three-day annual meeting of the association, by reason of the absence of the annual luncheon and dinner, and the exhibit of materials and equipment by the Bridge and Building Supply Men's Association. However, the absence of these features was offset to a large extent by the greater urgency of the problems at hand and the greater intensity of the program —with twelve addresses and papers and seven committee reports—giving emphasis throughout to the more critical of these problems, including those of labor, materials, salvage, maximum utilization of work equipment, avoiding interference with traffic, the maintenance of coaling and sanding plants, the carrying over of bridges and trestles, and the car supply situation.

Many Addresses Feature Program

Special features of the meeting included a four-part symposium on the Problem of Labor Supply, a four-part symposium on Bridge and Building Materials in Time of Scarcity, and an address at a special session on Wednesday evening on Railway Men In The War, by Lt. Col. Robert A. Radford, chief, Engineering branch, Railway division, Office of Chief of Transportation, U. S. Army. Through the courtesy of the United States Steel Corporation this address was followed by a technicolor moving picture entitled "To Each Other," showing the place of steel in the war.

The speakers who addressed the four regular sessions of the meeting, other than those taking part in the two symposiums, included H. R. Clarke, chief engineer of the Burlington system, and president of the American Railway Engineering Association, Chicago, who, at the opening session, spoke on Maintenance Essentials in War Time, and Warren C. Kendall, chairman, Car Service division, Association of American Railroads, Washington, D. C., who discussed car supply as it is affected by maintenance of way operations.

The symposium on Labor was headed by Edwin M. Fitch, assistant director, Division of Transport Personnel, Office of Defense Transportation, Washington, D. C., who reviewed the over-all picture of the labor supply as it affects the railroads, and more particularly the maintenance of way and structures forces. He was followed by W. G. Powrie, engineer maintenance of way, Chicago, Milwaukee, St. Paul and Pacific, Chicago, who told of the experiences of his road in the employment of high school boys in maintenance of way work since early last spring, and by Malcomb Young, supervisor of track, Pennsylvania, Warsaw, Ind., who recited the experiences of his road in the employment of women in maintenance operations. The fourth part of this symposium was a paper by L. E. Peyser, principal assistant architect, Southern Pacific, San Francisco, Cal., who told of the effective aid that had been secured by his road through the employment of week-end workers.

The symposium on Bridge, Building and Water Service Materials in Time of War was opened by A. C. Mann, vice-president, purchases and stores, Illinois Central, Chicago, who discussed the general over-all material situation as it affects the railways, with emphasis on those materials employed in bridge, building and water service work. Others who participated in the symposium were O. F. Dalstrom, senior structural engineer, Division of Civilian Supply, War Production Board, Washington, D. C., who submitted a paper on What We Have Discovered—In Materials; A. L. Sparks, architect, Missouri-Kansas-Texas, who spoke on What Building Men Can Do to Help; A. M. Knowles, engineer of structures, Erie, who submitted a paper on What Bridge Men Can Do to Help; and E. M. Grime, engineer water service, Northern Pacific, who submitted a paper on the material situation from the standpoint of water service men, and what they can do to help. Each of the symposiums was followed by a round-table discussion

Officers Hold Two-Day Conference

Twelve addresses and papers and seven committee reports cover many war-time problems, with emphasis on labor and materials

G. S. Crites
President

R. E. Caudle
First Vice-President

A. M. Knowles
Second Vice-President

N. D. Howard
Third Vice-President

J. L. Varker
Fourth Vice-President

E. V. Heffern
Secretary

Bridge and Building Association

Officers 1942-43

G. S. Crites, president (division engineer, B. & O., Baltimore, Md.).

R. E. Caudle, first vice-president (assistant engineer structures, M. P. Lines, Houston, Tex.).

A. M. Knowles, second vice-president (engineer structures, Erie, Cleveland, Ohio).

N. D. Howard, third vice-president (managing editor *Railway Engineering and Maintenance*, Chicago).

J. L. Varker, fourth vice-president (supervisor bridges & buildings, D. & H., Carbondale, Pa.).

Elinor V. Heffern, secretary, 310 So. Michigan Ave., Chicago.

F. E. Weise, treasurer (chief clerk, engineering department, C. M. St. P. & P., Chicago).

Executive Committee

R. E. Dove, past-president (assistant engineer, C. M. St. P. & P., Chicago). (Term Expires 1943)

Martin Meyer, Sauerman Bros., Chicago.

L. E. Peyser, assistant architect, S. P., San Francisco, Cal.

K. L. Miner, supervisor bridges and buildings, N. Y. C., Albany, N. Y. (U. S. Military Service). (Term Expires 1944)

F. G. Campbell, assistant chief engineer, E. J. & E., Joliet, Ill.

J. S. Hancock, bridge engineer, D. T. & I., Dearborn, Mich.

L. C. Winkelhaus, architectural engineer, C. & N. W., Chicago.

F. E. Weise
Treasurer

of the subject under consideration, giving opportunity to crystallize the many factors developed and providing a forum for the presentation of personal experiences or suggestions on the part of those attending the session.

Supplementing the foregoing features of the meeting, technical reports were presented by committees on the following subjects: Revising Working Practices to Eliminate Interference With Traffic, L. R. Lamport, assistant to chief engineer, Chicago & North Western, Chicago, chairman; Securing Maximum Utilization of Work Equipment, D. T. Rintoul, general bridge inspector, Southern Pacific, San Francisco, Cal., chairman; Carrying Over Bridges

and Trestles, H. T. Livingston, engineer of bridges, Chicago, Rock Island and Pacific, Chicago, chairman; Men—How To Secure and Hold, M. D. Carothers, chief engineer, Alton, Chicago, chairman; Materials—Possibilities of Relief Through Substitutes, W. A. Sweet, general foreman bridges and buildings, Atchison, Topeka and Santa Fe, Newton, Kan., chairman; Salvaging Bridge, Building and Water Service Materials, H. W. Wuerth, division engineer, Chicago, Milwaukee, St. Paul and Pacific, Savanna, Ill., chairman; and the Maintenance of Coaling and Sanding Plants to Meet Today's Exacting Requirements, A. L. McCloy, supervisor bridges and buildings, Pere Marquette, Saginaw, Mich., chairman. Summing up at the closing session on Thursday, R. E. Dove, assistant engineer, Chicago, Milwaukee, St. Paul and Pacific, Chicago, and the most recent past-president of the association, reviewed the many constructive ideas and suggestions brought out in the various addresses, reports and discussions.

All of the sessions, which were held at the Hotel Sherman, were presided over by G. S. Crites, president of the association, and division engineer, Baltimore and Ohio, Baltimore, Md. The attendance at the meeting totaled 145, of whom 105 were railway officers, this number including a number of members of two committees of the American Railway Engineering Association—Rail and Water Service, Fire Protection and Sanitation—which scheduled their meetings concurrent with the conference of the Bridge and Building Association so their members could enter into the deliberations of the conference.

New Officers

In the election of officers for the ensuing year, J. L. Varker, supervisor bridges and buildings, Delaware & Hudson, Carbondale, Pa., and fourth vice-president of the association, was elected president; R. E. Caudle, assistant engineer structures, Missouri Pacific Lines, Houston, Tex., was re-elected first vice-president; Neal D. Howard, managing editor, *Railway Engineering and Maintenance*, Chicago, was advanced from third vice-president to second vice-president; F. G. Campbell, assistant chief engineer, Elgin, Joliet & Eastern, Joliet, Ill., and a director of the association, was elected third vice-president; J. S. Hancock, bridge engineer, Detroit, Toledo & Ironton, Dearborn, Mich., and a director of the association, was elected fourth vice-president; and Elinor V. Heffern was re-elected secretary. In addition, F. E. Weise, chief clerk to the chief engineer of the Chicago, Milwaukee, St. Paul & Pacific, Chicago, and the treasurer of the association, was elected treasurer emeritus, a newly created position, and C. R. Knowles, superintendent of water supply, Illinois Central, retired, Chicago, and a past-president of the association, was elected treasurer.

Four new directors were elected as follows: A. L. McCloy, supervisor of bridges and buildings, Pere Marquette, Saginaw, Mich., and W. F. Martens, general foreman bridges and buildings, Atchison, Topeka and Santa Fe, San Bernardino, Cal., each for a term of one year to fill vacancies created by the elevation of Messrs. Campbell and Hancock to vice-presidents; and E. H. Barnhart, division engineer, Baltimore & Ohio, Garrett, Ind., and A. B. Chapman, bridge engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago, each for a term of two years. L. E. Peyser, principal assistant architect, Southern Pacific, San Francisco, Cal., was re-elected a director for two years.

The secretary's report showed 597 members of the association in good standing, this number including 41 who joined since the last annual meeting. The following subjects were selected for study by committees during the year: Post War Values in War-Time Practices in Bridge, Building and Water Service Activities; Increasing the Capacity of Water Service Facilities to Meet the Demands of Heavier Traffic; Keeping Work Equipment in Service; New Possibilities in Building Design and Materials; Bridge Inspection in the Light of Current Restricted Maintenance; the Year's Developments in Labor; Recent Developments in the Treatment of Timber to Increase Its Fire-Resistance; and Welding in Bridge, Building and Water Service Work.

All of the committee reports presented at the meeting, with abstracts of the discussions which followed their presentation, as well as abstracts of the addresses of President Crites and Messrs. Clarke and Kendall, are presented in this issue. The addresses and papers of Messrs. Radford, Mann, Fitch, Dalstrom, Powrie, Peyser, Young, Knowles, Sparks and Grime, will be presented in subsequent issues.

President's Address

In his presidential address, President Crites reviewed briefly the considerations that led the association to carry on with a war-time conference this year, spoke of the large part that bridge and building men have already played in insuring the success of war-time rail transportation, and, referring specifically to the various reports to be presented to the meeting, stressed their great value, both in their technical aspects and as a means of strengthening the morale of men faced with seemingly insurmountable problems. He also urged members to carry on to the all-important goal of victory, and closed with a note of confidence in the future of the country, the railroads and the association. He said, in part, as follows:

"This is a war-time conference of our association. We are here to do everything within our power to bring this war to a quick and satisfactory conclusion for ourselves and our allies.

"We are meeting in this two-day conference because of recognition on the part of your officers that while the members of our association have been accomplishing almost impossible tasks, these tasks have often been accomplished with confusion and discouragement due to the overwhelming necessity, in the face of many difficulties, for keeping their structures in condition for the most exacting service ever demanded from them. The investigations carried on by our committees and incorporated in the reports to be presented before this meeting, are unusually timely, and should be of invaluable help to our members, and to bridge and building men generally, in meeting the difficult tasks that confront them.

"Bridge and building men have made a remarkable record to date. They have kept bridge structures of all kinds in service, with few or no slow orders, under more, faster and heavier traffic than ever before. They have done this with small labor forces in most places and with no abundance of material at any place. They have kept turntables going 'round and round,' enginehouses tight, pipe lines together, ash and inspection pits safe, coal dumpers working, grain elevators functioning, fire protection intact, and all other structures performing their war-time duties as expected of them.

"This has not been done by wishful thinking or by elaborate planning for the future. Rather, it is has been done by doing each day what has been necessary. At times, bridge and building men may offer a silent prayer for the morrow, but regardless of what the morrow may bring, they are always ready and continue to do first things first. As true Americans, they have watched many of their younger and more adventurous companions join the armed services to do their bit overseas, and have also seen some of their other young and active asso-

ciates leave railroad employment to work in munitions plants or other war industries, where they feel they may take a more important part toward bringing the present conflict to a quick and successful conclusion. The remaining forces willingly take up the added load.

"Versatility, initiative and resourcefulness have enabled bridge and building men to meet their responsibilities to date and to keep free of failures the many structures under their care. This has not been an easy task. Their acomplishments during the last year or more have not been achieved without sweat and brain-wrecking conniving. However, these men were never nurtured in soft cribs; they do best in hard bunks.

"The immediate future will afford no feather bed for our members. We have done well to date, but there is still much for us to do. Victory is still the all-important goal. All else is unimportant in comparison, and it is to that end that we are all working.

"With victory gained, what of the future? I believe we can be sure of this—with tasks well done behind us; with jobs that call for latent reserve out of the way; with improvisation at times found as good or better than that improvised for; and with wits sharpened and a knowledge that we have done what may have seemed impossible—we can look to the future with confidence and with cheer. Our association can also face the future with confidence.

H. R. Clarke* Points Out War-Time Maintenance Essentials

MAINTENANCE essentials in war time are exactly the same as they have always been and always will be; that is, to maintain our railroad structures, signals and tracks to established standards, in the most economical way and by the most efficient methods. The difference at the present time is that this is somewhat more difficult to do and the results of failure would be more disastrous.

As the job is more difficult, the challenge is greater—but maintenance of way men have always responded to a challenge. They have never been in the habit of admitting that a necessary job could not be done.

Railroads Must Do Job Alone

Under ordinary conditions, if the railroads failed, some other means of transportation would be available—another form could be used. Now, that is not possible. Today, if the railroads fail, transportation breaks down. In peace time, that would be unpleasant and uncomfortable; now, in war time, it would be disastrous. You know what it would mean to the nation and to the world. You know, but I wonder if it is known generally—if people at large grasp the tragic possibilities. I feel it is not and that they do not.

Not long ago a man of near cabinet rank, addressing leaders in industry, labor and the press, said:

"Civilians are partners in the war, and none more than the men who make the weapons with which our soldiers fight."

Very true, but what good would tanks, guns, planes or munitions be, stranded anywhere between the Atlantic and the Pacific? They are needed in Australia, Alaska, India, Russia—everywhere but where they are made. Unless transported from where made to where needed, they are worse than useless, and moving them is the railroads' job. No other method or means will move them, and yet the railroads are seldom mentioned. Industries proudly fly their "E" pennants and their employees wear badges or buttons, which they have every right to do. Why not the railroads? I do not know the answer—I doubt if anyone does. Our reward, at least for the present, must be that most satisfying one—the knowledge that a hard job has been well done.

Why is our job difficult? The answer is easy. The railroads are handling the heaviest traffic they have ever handled in history, doing it under the greatest pressure, and there is a serious lack of the men, materials and machines which are needed with which to do the job as it should be done.

What can we do about it? That is not so easy to answer. We can all think of many things others might do, but I fear that if we wait for or depend on these, the consequences will not be to our liking. There may, and probably will, be a tragic and disastrous failure before corrective action is taken. So it comes back to us. We must do the job under existing conditions, using what we have.

Serious Shortages

The three things wherein the most serious shortage exists—men, machines and materials—are so interrelated that we can hardly think, much less talk, of one as separate and distinct from the other. Insufficient labor could be offset, to some extent at least, by the use of machines and work equipment, if they could be secured, and a lack of materials could be made up for partially by an increase in labor, and to some degree the reverse of that is true, but when none of these essentials is available in the amount needed, the problem becomes one which demands the best that any and all of us have to give.

I shall not attempt to discuss all that we can and must do. That is the purpose of this meeting, and I am sure it will be well done. I shall merely touch on what seems to me to be the outstanding points.

First, material—steel, copper, wood—nearly everything we use, is scarce and classed as critical, and must be used to the best advantage. This means that there must be no waste of any kind—the prompt picking up and shipping of any unused material, new or usable second-hand, to some other job, or to the storehouse where it can be sent out to some place where it is needed. All requisitions for tools, or for materials and supplies of any

Power Tools and Work Equipment Must Be Used Extensively to Offset the Lack of Manpower

*Chief engineer, Burlington system, Chicago. President American Railway Engineering Association.

kind, should be checked carefully and no excess ordered. If you ask for, and by any chance receive, too much, someone else will be short and his work handicapped.

Must Plan In Advance

Plans should be made well in advance of starting a project, and the stores department be given advice as to the materials needed. This is most essential as it is not possible to maintain the liberal stores stock once carried, and such a stock should not be carried under present conditions. Ingenuity and initiative in finding ways to use what we have, instead of what we might like to have, will pay large dividends.

When speaking of materials, it will do no harm to mention the importance of releasing promptly cars used for company material. The way in which shippers in general are complying with this important rule is a large factor in making possible the successful job the railroads are now doing. If we do not make an even better showing, censure cannot be too severe.

It is fortunate that when manpower became scarce on the railroads, we were fairly well supplied with power tools and work equipment. It has been and is still practically impossible to secure additional units, so again it is up to us to make the most of what we have. Every piece of equipment should be used intensively. Many times it can be double-shifted at least, and so secure twice the output. The condition of all machines should be checked closely and frequently, and repairs made as needed to avoid breakdowns of long duration.

Here again, plans should be made in advance and the work scheduled so that equipment can be kept busy and, so far as possible, furnished for all work where its use will save labor. Equipment not in use and not needed immediately should be reported, and so made available for use where it is needed. To be selfish under present conditions, to hoard material or machines, to say nothing of men, is unpatriotic and disloyal.

Manpower Situation

Difficult as the situation is with regard to machines and material, the manpower situation is even more difficult and critical. The demands are far in excess of the supply, and a new factor, the human element, not involved in material or machines, must be taken into account. Many things have been done to add to available manpower. The minimum age limit has been lowered and the maximum raised, retired employees have returned to active service, physical standards have been modified and, in some cases, examinations have been waived. In addition, other measures of qualification for various positions have been lowered. All of this places on foremen and supervisors a responsibility that is greater than ever before. The work must be done with the help of men less experienced, less capable and less efficient than we have had in the past, and the factor of safety cannot be decreased. This situation calls for the highest and best type of supervision and leadership that the men and officers of a department, long noted for excelling in this respect, can give.

It is certain that we cannot do all the work we would like to do or that needs to be done. It is equally certain that we cannot fail in our responsibility to maintain the tracks and structures in safe condition to carry the traffic of a nation at war. To insure that we do not fail, each employee and officer who has any supervisory responsibility whatever, must know his job thoroughly. He must be intimately familiar with the property for which he is responsible, in order that he can make sure that the most important and urgent work is being done, and that work that must be postponed, can be deferred safely.

The assistance of manufacturers and supply men is needed now much more than when the job was not so difficult. The greatest help they can be to us, the railroads and the country, is to give us as promptly as they can full and accurate information in regard to the delivery of material, equipment, etc. If it is impossible to make good on a promised delivery, the sooner we know that the better. We can then, perhaps, modify our plans and adjust our forces to meet the changed conditions. Also, if it becomes necessary for a manufacturer to offer some substitute, that information should be given us so we can act on it. Delay in giving such information makes our job more difficult. Surely, we will learn of it in time, and those manufacturers whose representatives are prompt to help us in this way as they can, will be in better standing than those who seem to consider such advice a military secret.

To date the railroads have done a great job well. It has been done by the co-operation of all concerned—shippers, the railroad supply industry, and all railroad employees from presidents down—and the Association of American Railroads and the Office of Defense Transportation should not be forgotten. Perhaps the real test is yet ahead. I think it is; but if we are all determined to do our job and to help the other fellow do his, we need have no fear as to what the final result will be.

Car Supply, As Affected By Maintenance of Way Operations

By Warren C. Kendall

Chairman, Car Service Division
Association of American Railroads
Washington, D. C.

THERE is an interdependence of responsibility among all of us on the railroads to see that our job is so well done that it will contribute to the success of the railroad program in its entirety. We must not permit anything in any way to slow up or to affect adversely the processes which, day by day, are proving that ours is the industry which is admittedly outstanding in its effectiveness in aiding the prosecution of the war. Without transportation, there could be no assembling of the personnel or the materials necessary to any war program.

Things began to happen soon after Germany entered Poland, and they have been happening at an increasing tempo ever since. The peak of our difficulties as a transportation machine, however, still lies ahead of us. We must rise to our responsibilities. There is no other way. The job must be done.

We could not, or at least we did not, foresee the loss of our normal supply of rubber; of the control of the supply of petroleum and its products; of shipping, coastwise and intercoastal; and of many of those adjuncts to rail transportation we had come to take for granted. Nothing of this sort could happen. But it did, and the railroads were called upon to take up the slack.

With the continuing loss of traffic volume, both freight and passenger, beginning in 1930, the railroads, of necessity, reduced their ownership of freight and passenger cars and of

locomotives. Railroad earnings were at such a low state that there was no money for purchasing equipment. Besides, there seemed no need to maintain the previous level of ownership. As a result, there was a reduction of not less than 500,000 freight cars, 16,000 passenger cars and about 20,000 locomotives. It is important that we bear in mind that this reduced level of ownership has never been made up; nor does it now appear that it can be. Circumstances are proving that perhaps it need not be, except, perhaps, in part. There has been a gain in the capacity of newly acquired freight car units; also in the tractive power of those locomotives built. But the aggregate freight car capacity and locomotive power are still far below that of the equipment which was in service in 1929.

Bridge and Building Forces Must Do Their Part by Unloading Material Promptly

Organization—Important Factor

There has been one compensating factor resulting from all these experiences. Except for this, the story of railroad accomplishment could not be told. That factor is expressed in one word—organization. The railroads are now organized into a more closely knit group than ever before. And what is perhaps of greater importance, the railroads' customers, the shippers and receivers, have organized on a countrywide basis to demonstrate by their co-operation, one with another and with the railroads, what can be accomplished by concerted will to obtain the best possible use of freight cars.

Organization includes also those agencies of government which are so instrumental in giving direction to things which the railroads themselves could not do. The Office of Defense Transportation and the Interstate Commerce Commission, with its Bureau of Service, are indispensable to the effort which the railroads are now making to meet the demands which are forced upon them. And last, but by no means least, the biggest single customers of the railroads, the Army and Navy, have organized their transportation requirements in such a manner as to meet most effectively the operating practices of the railroads, and at the same time serve themselves to the best advantage.

Remarkable Achievement

As the war in Europe developed and our own war clouds began to gather, the disciples of disaster, of whom there are always too many, began to cast before the public forebodings as to the inevitable inadequacy of rail transportation. In the fall of 1941, and prior to Pearl Harbor, there came from several sources, and from those high in authority, advices that a breakdown in transportation lay just ahead. It is significant that this gloom did not originate with railroad men, for they never lost confidence in themselves.

We may now take some measure of the error of these prophets of doom. The total net ton miles for the war year of 1918 was 405 billion, and for that banner year of heavy traffic volume—1929—ton miles totalled 447 billion. In 1941, the year when a serious car shortage was forecast, net ton miles totalled 475 billion, or 70 billion above that of 1918. It is now estimated that the net ton miles in 1943 will reach the astounding total of 730 billion, which is nearly equal to the combined total of the World War year 1918, and 1939, the year just prior to the outbreak of the present war. It is of particular importance to bear in mind that this is being accomplished despite that reduction in equipment ownership mentioned previously—500,000 less cars and 20,000 fewer locomotives.

The railroads have been making new records month by month in car handling, which are indicative of their present-day efficiency.

Nothing short of the utmost in teamwork on the part of everyone has been instrumental in producing these results. Every department of the railroad has worked with every other department, supplementing each other's efforts toward a common purpose. It has been a remarkable demonstration of what can be done when the pressure comes.

At this point let us see how we have performed in the matter of car handling. We have been both good and bad, in spots. The monthly statement of the Car Service division for September 15, shows that, for other than coal and coke, 10,500 cars were being held under load for an average of 3.9 days. When those in the maintenance of way and structures department consider that these data include cars under load with ties, rail, fastenings, and the like, it probably seems to them that the record is not so bad. But remember, this is an average figure of detention, including the 20-day car and the 1-day car. Compared with records of a few years ago, this average of 3.9 represents a substantial improvement. But this figure is not as low as it should be, nor as low as it can be.

The same report of the Car Service division for September 15 shows one large road holding hundreds of cars under load with company material an average of 11.6 days. Another road 4.0 days. Roads of comparable size, or even larger, show records of 2.6, 2.1 and 1.2 days, respectively. Of the smaller roads, one shows 49 cars an average of 8.0 days. Another, 54 cars, 4.3 days. Other medium-sized roads show 24, 5, 4, 3 and 2 cars detained 1.3, 1.0, 2.0, 2.0 and 1.0 days, respectively. It can be done.

Cars are worth, for revenue purposes, an average of $10 per day. The total cars reported under lead with company material, other than coal and coke, as of September 15, totalled 10,500. This, at an average of 3.9 days per car, totalled 40,950 days. The potential earning capactiy of this equipment to its owners was $409.500 for the period held. We should ask ourselves the question—how much can I, as an individual, contribute in time of need to my railroad and to the public it serves, by closer supervision?

What Lies Ahead?

Those who are best informed on what lies ahead forecast that demands for freight transportation in 1944 will require that railroads deliver about six per cent more ton miles than in 1943. This may need revision upward, depending upon the supplies of rubber and gasoline and the progress of the war. It seems unlikely that it will be revised downward.

No great amount of new equipment can be expected within the next 12 months—perhaps 40,000 cars. Possibly 1,000 new locomotives may be made available. With the prospects of increased demands for rail transportation, and no material increase in the availability of freight car equipment, it becomes evident immediately that

the railroads must do even more with what they have than has been done in the past.

Maintenance Men Can Help

What can the maintenance of way and structures forces contribute?

So far I have referred specifically only to the more prompt release of cars under load with company material as a contribution which those in your departments can make toward increased car efficiency. There are others.

Despite the shortage in manpower, it will doubtless be found possible to transfer company material, which must be kept on cars for temporary periods, from revenue to non-revenue equipment.

When loading material which is for local distribution, use maintenance of way or non-revenue cars for such loading.

When using revenue cars for company material, see that they are loaded to capactiy—cubical or weight. For example, a gondola car will carry three or more times as many ties loaded on end as when loaded horizontally with the top of the sides of the car.

Don't load cars in advance of acutal requirements for use or distribution. The cleaning of cars is usually under the supervision of the maintenance department. See that cars on the cleaning tracks are conditioned with the least possible delay.

One line of effort should especially challenge the attention of each one of us, whatever our particular duties may be. May we not, each of us, appoint ourselves an engineer of research, and in line with such activity make some contribution to our profession during this critical period of railroad history.

There is a part for each to play in developing his opportunities, and the obligation rests upon all of us to help maintain our railroads in the high place they now occupy among industries serving the nation in its war program. Let research, more research, and still more research, be our watchword: With this constantly in mind, we shall not miss the goal.

Discussion

R. E. Dove (C.M.St.P.&P.) called attention to a rule that is being enforced by some government agencies, which requires that contractors engaged in government work release all cars within 24 hours of receipt.

Elmer T. Howson *(Railway Engineering and Maintenance)*, stated that at a recent meeting of the Regional Shippers Advisory Board at St. Paul, it was reported that more than 1,000 grain elevators in the Northwest had been compelled to close because of lack of cars. He also reviewed some of the measures that shippers have taken to release cars promptly and emphasized that they have done a magnificient job, stressing the fact that railway men are not doing their job satisfactorily unless they are doing as well.

Mr. Kendall confirmed Mr. Doves statement about the release of cars by government contractors, and said that the army and navy particularly are doing their best to release cars. In reply to Mr. Howsons statement about closed elevators, he called attention to the fact that in former years farmers had stored much of their grain on the farm and that the grain movement had extended over many months. This year, however, partly as a result of high prices for grain, they have unexpectedly brought it into market directly from the combines. This action came without warning and it took some time to move the necessary cars into the affected territory. Cars have been sent there in such number that the number of closed elevators has now been reduced to 700. Mr. Kendall also paid high tribute to the work of the Regional Shippers Boards.

Materials—Possibility of Relief Through Substitutes

Report of Committee

THE preparation of a report on the substitution of materials is particularly difficult at this time, because of the confusion now prevailing throughout the entire category of materials. The conditions are changing so rapidly, almost from day to day, that a material that is available in quantity today may become "critical" and unavailable overnight, thus forcing the substitution of another material which in turn may be impossible to obtain.

This situation has now reached the point where possibly the first consideration given to substitution should be the use of second hand material, where it can be made available. A careful survey of abandoned or partially-occupied buildings will bring to light an amazing amount of salvable materials that are not otherwise available. In other words, the old New England adage is more than normally applicable under the present circumstances: "Make it do; wear it out; do without." We are forced to this unless substitutes are found.

W. A. Sweet
Chairman

The national war effort has brought about a serious restriction of building materials in general use on the railroads. Mention may be made especially of all types of metal and kindred products; lumber, bituminous products, lead and oil paints, reinforced concrete products, etc.

Buildings

Through very careful study and analysis of each project, certain critical materials can be eliminated and non-critical materials substituted for them; in many cases, at very little extra cost. In other cases, it may not be practicable to eliminate critical materials entirely, but they should be held to a minimum through careful planning.

Probably the most widely used building material on the railroads is lumber; it was readily obtainable, and bridge and building men were adept in using it. But lumber is now on the critical list and other materials can take its place, to a great extent.

The exterior walls of buildings may be constructed of brick, structural tile, or other similar products that are not

on the critical list. Masonry block units make very satisfactory exterior, as well as interior, walls, although when they are used as exterior walls, it is best to apply stucco or some other water-repellant coating, especially when the inside surface is to be plastered directly on the units. The use of stucco on masonry units not only serves as a waterproofing agent, but gives a very pleasing appearance and is very elastic in design. Stucco can be purchased in various colors, already mixed, or it can be mixed on the job. Various kinds of structural building tiles and bricks are also available, which are enamelled on both faces, thus presenting a pleasing appearance on the exterior, as well as the interior, without any further treatment of either side of the wall.

While not to be classified as a substitute, corrugated asbestos also has a wide range of uses. It may be employed for siding, where corrugated galvanized steel would ordinarily be used; however, the supporting framework must be heavier, and a much better job is obtained. Corrugated asbestos has been used widely on roofs, especially on warehouses, machine shops, power houses, etc., where conservation of heat is not a vital consideration. This material is also used for interior partition walls, although usually not corrugated.

Probably the best substitutes for wood sheeting on frame walls are the various types of fiber board. Such materials have been used for many years and have proved very satisfactory. They can be used on interior walls as a substitute for lath and plaster; or can be used as a plaster base. Panel board ceilings of these materials can be employed in many pleasing designs. When applied to exterior walls, a finish covering must be added, such as wood siding, brick veneer, or similar construction. Fiber board can be obtained with a mineral-surfaced asphalt coating, fabricated to imitate brick siding; this material can be applied directly to the framework of exterior walls, forming a weatherproof surface.

Decorative cement-asbestos materials can be used to good advantage on interior walls as coverings for obsolete wood wainscot and beaded ceiling prevalent in many of the older station buildings. These materials can be obtained in large sheets ⅛ in. thick, and in several colors—including green, tan, rose and black. They are very well suited for remodeling work.

Wood flooring has been the most common construction for many years. However, lumber is now on the critical list and there are a number of very good substitutes. Asphalt tile is an excellent material; it can be applied over wood floors as well as concrete; bridge and building men are becoming familiar with its application and can do a satisfactory job of laying it. The tiles come in a wide range of colors and are suited for use in offices and station waiting rooms. Various types of mastic floor materials are also available which can be applied directly to wood floors; however, many of them require wire mesh nailed to the existing floor; of course, this is not necessary where they are laid over concrete floors.

An Example of the Use of a Non-Critical Material Is This Oil House with Asbestos-Cement Roofing and Siding

Since metal lath is on the critical list and no longer available for plaster work, a very suitable substitute is gypsum rock-lath. In many cities, it is given the same fire-resisting rating as plastering with metal lath. This material is also made with a bevelled edge; the joint is filled with a cementing compound and paper strips are cemented thereon, thereby concealing the joints and forming a surface suitable for painting. Such construction is less liable to show cracks than metal lath and plaster work.

Steel sash are on the critical materials list and are no longer available. As substitutes therefor, careful consideration should be given to the relative merits of wood sash and glass blocks. Windows may be of the fixed type with a ventilating panel, similar to steel sash construction except that they are of wood, including frames and muntins; thus they eliminate sash weights and cords, pulleys, and weight boxes. It is not always practicable to use wood sash in large openings because of the large mullions, muntins, and rails that are necessary, and that reduce the amount of natural light admitted.

Use of Glass Block

In many cases, glass blocks can be used to good advantage. The modern trend in architecture is to use glass wherever practicable. There are a variety of uses to which glass may be put, including decorative panels, fixtures, wall surfaces, interior non-bearing partitions, etc. Glass blocks may be used in interior non-bearing partitions in lieu of wood framing, plaster and painting. They may be used in enginehouses, machine shops, and other railway buildings in lieu of wood or metal sash. They are not affected by gases or other corrosive agents, and provide a more even distribution of light than the ordinary window. The heat loss through glass block construction is about half that of an ordinary window; thus saving considerable expense of heating. Very little maintenance is required, and where blocks are broken, replacement is simple. Although the initial cost of glass block construction is somewhat more than window construction, the additional cost will be saved over a period of time and the salvage value is about one hundred per cent.

It has been the custom in the past to construct steel lintels for window, door, and other openings in masonry walls. As this material is now critical, substitutions can be made in part at least. For structures of hollow building blocks, the hollow spaces in the proper number of blocks to span the opening, can be filled with concrete and a few reinforcing bars, thereby forming an excellent lintel with the use of very little critical material. For lintels in brick walls, or other solid masonry construction, a wooden beam of the proper size to carry the load, with an angle attached to carry the exterior course of brick, is suitable; often usable timbers and usable steel angles are available.

Heretofore, copper, sheet metal, and wrought iron pipes have been used for gutters and down spouts respectively on various types of buildings. These are all very critical materials and substitutes are available. Wood gutters are on the market in finished condition and their use does not detract from the appearance of the structure; wood down spouting can also be constructed. These, of course, should be replaced when metal is again available. In some cases, scrap boiler tubes have been used for down spouting.

Copper and sheet metal have long been used for flashing. Much of these metals can be eliminated by using the same materials that are used for the

roofing—particularly with flat-pitch built-up roofs. Asphalt-impregnated cotton fabrics make excellent flashings, but the cotton is more critical than the felts.

Hot air heating ducts, when not underground, have always been constructed of sheet metal. They may be constructed of cement-asbestos board, which is not critical material, and the cost is not excessive when compared with sheet metal construction.

The restrictions on hardware are rigid and the simplification of the requirements is essential, as there is no substitute. Consideration should be given to the necessity for complete lock-sets on every door; it may be possible to eliminate a number by using simple latches or bolts. Glass push-plates can be substituted for metal, and hardwood push-bars for metal. The necessity for door checks should be analyzed carefully.

In larger structures that require the use of trusses, wood trusses should be considered in order to conserve the more critical materials. Wood trusses can be purchased already fabricated, or they can be built in the field. Many ingenious designs have been prepared for such trusses and they are being used more and more as a permanent substitute for steel.

Sanitary and Locker Facilities

Many of the larger plumbing concerns have prepared catalogues showing the various sanitary fixtures that may be purchased, conforming to Government regulations. It has been recognized that such fixtures are necessary, but the brass, nickel, and chromium metal fittings have been eliminated and cast iron substituted.

Metal partitions are no longer available for toilet and shower stalls; this applies also to metal lockers. A suitable substitute for toilet and shower stalls, is plywood, which is also critical but not to the extent of metal. Lockers are also constructed of plywood; however, consideration should be given to the places where they are to be used, as it is not desirable to use plywood in enginehouses, machine shops, or enginemen's locker rooms, for the service in such locations is very detrimental to such lockers.

Water Service

Most of the materials that it is possible to use as substitutes in water service are critical to a greater or lesser extent. Therefore, the solution of the problem here is to make only those installations and renewals that are imperative, and to use materials lower down in the critical list than ordinarily applied; viz: substitute steel for copper; timber for steel; concrete for timber, and composition and pulp products for rubber. Economy must not now be allowed to influence the choice of materials. In many regions, labor is critical and it may be more helpful to the war effort to use a more critical material, if by so doing a substantial saving in man hours can be effected.

Copper is among the most critical water supply materials. Wrought iron pipe swabbed with asphaltum or encased in concrete can be used in place of copper pipe where soils are highly corrosive. Brass clamps and ground wires for electrical connections should be utilized to reduce copper requirements. Substitutes for copper and rubber gaskets are felted asbestos, putty, cardboard, roofing paper, and white lead on canvas.

As large quantities of pipe are used annually by the water service personnel, much thought should be given to finding suitable substitutes for critical materials. Asbestos cement pipe, used by some railroads even prior to the present shortage in iron and steel pipe, is acceptable and economical in certain cases, such as a long run where there are few turns or take-offs; cast iron fittings are required at such locations, as well as concrete thrust blocks. Rubber rings, held in place by asbestos couplings, seal the joints securely, even in installations subject to vibration from passing trains. This pipe is not recommended where excessive "water hammer" can be expected, such as in penstock service lines. It is manufactured in four grades, to carry pressures ranging from 50 to 200 lb., and from 3 in. to 36 in. in diameter; it comes in 13 ft. and 6 ft. 6 in. lengths.

Both wood stave and reinforced concrete pipe require some steel for reinforcement, but the saving in metal justifies their use during the emergency. Vitrified pipe, encased in concrete, can be used in some instances. The recently-developed plastic pipe, in the smaller sizes, has possibilities; it is light in weight; yet tough, durable, and resists corrosion. It can be threaded with standard pipe dies or welded with a blow-torch at a temperature of about 400 deg. Its high cost and inability to withstand temperatures much above 175 deg. must be overcome before it can take the place of steel pipe.

The welding of joints in steel pipe is an excellent substitute for couplings, bolts, and gaskets. Likewise, the repair of leaking pipes, or broken and damaged equipment of all kinds, by welding makes new materials unnecessary, as well as saving man-hours over making new installations.

Reinforced concrete and treated timber water tanks, using comparatively smaller amounts of steel, are common substitutes for steel tanks and towers. Pile sub-structures are being used frequently in place of steel sub-structures for wooden water tubs.

Bridges

In bridge maintenance, several different types of construction are employed to conserve critical materials. Frame bents may be constructed with pipes, and caps may be built up by using two or three smaller timbers, fastened securely with bolts and metal connectors. Helper posts and stringers can often be added to a pile bridge structure, and thus defer heavy renewals for several years. Pile bents can be double-capped, and additional piles driven to extend the life of the structure for some time.

Pile structures requiring out-of-face renewal may be replaced with concrete pipe, concrete boxes with covers reinforced with scrap rail or wood box culverts constructed with usable material. However, careful study should be given to the provision of adequate waterway. When it is necessary or advisable to construct a wood box culvert as a temporary expedient, it should be built of usable materials and large enough to permit the installation of a permanent culvert inside when it becomes necessary.

With steel structures, it is possible to make lasting repairs by the use of second hand materials that are usually to be found at the railroad's reclamation plant. It is also practical, although somewhat of a temporary nature, to provide adequate bracing, or strutting, by the use of oak timbers; this should only be done under the jurisdiction of the bridge engineer.

Petroleum products, such as bituminous concrete, cut-back asphalts, and asphalt base paints, are restricted and can only be obtained under high priorities. Bituminous concrete and cut-back asphalts were widely used for station platforms, shop walkways, etc. Substitutions can be made with stone screenings, brick, or concrete and also, by a natural rock asphalt, which is not restricted; however, the use of this latter material is prohibitive for railroads located some distance from the source of supply.

Lead and oil paints are somewhat restricted, but can be obtained under proper priorities. It is recognized that paints are essential to the proper maintenance of structures. However, for interior work, there are a number of substitutes for oil paints and these should be used wherever possible. Cold water paints can be obtained in many colors and they are being used

more widely, following recent developments in the better grades.

The general outlook, at present, is that all materials will become more difficult to obtain. Therefore, it behooves all of us to plan carefully, eliminating all critical materials possible, and maintain close supervision.

W. A. Sweet (chairman), general foreman bridges and buildings A. T & S. F., Newton, Kan.; H. M. Church (vice-chairman), general supervisor bridges and buildings C. & O., Richmond, Va.; W. L. Anderson (vice-chairman), office engineer, C. & N. W., Chicago; L. E. Peyser (vice-chairman), principal assistant architect, S. P., San Francisco, Cal.; F. W. Dayton, architectural draftsman, C. & N. W., Chicago; H. M. Dick, master carpenter, Penna., Toledo, Ohio; A. G. Dorland, assistant engineer, E. J. & E., Joliet, Ill.; A. W. Glander, chief carpenter, C. M. St. P. & P., Mason City, Ia.; F. W. Hutcheson, assistant supervisor, bridges and buildings, C. & O., Newport News, Va.; F. H. Masters, chief engineer, E. J. & E., Joliet, Ill.; and B. M. Whitehouse, general bridge inspector, C. & N. W., Chicago.

Maintaining Coaling and Sanding Plants to Meet Today's Requirements

Report of Committee

THIS subject is a very important one. With our country at war and the railroads loaded almost to capacity, and with demands growing greater every day, coaling stations and sanding plants are facing more exacting demands than ever encountered before. Dependable coaling and sanding plants reduce the dispatching and road time of trains. More care than ever must be given therefore to keeping these plants in good operating condition. Rigid rules covering the inspection, operation and maintenance of these plants should be set up and strictly adhered to. Operators must be on the alert to detect any defects which may cause interference with their operation and report them immediately for adjustment or repair.

The bridge and building department must realize and accept its part in the teamwork necessary to meet the unprecedented demands thrown upon the railways of America to provide railway facilities of unquestioned dependability in every phase of operation and maintenance. Long-standing familiarity with the maintenance of coaling and sanding plants by the bridge and building forces has so far stood the acid test of performance on the job.

A. L. McCloy
Chairman

Coaling Stations

When the last report on coaling and sanding plants was presented to this Association in 1916, a wide variety of types of coaling plants were in service, including the primitive type where coal was shoveled into buckets and unloaded into the locomotive tender with a crane; the type where a car of coal was run up a trestle onto a high dock and the coal shoveled into pockets, with a coaling gate on the front side of each pocket to release the coal to the locomotive; and the chain link belt type of station.

Concrete coaling plants were then in their infancy, but with years of study and research these plants have been developed until they are now adequate if properly maintained. They have given good service year after year, although there may come a time when large repair expense will begin to develop. In various coaling plants of this construction, it is found that the parts that most commonly require renewal are those steel parts that are cast in the concrete. These include particularly the steel delivery chutes which pass the coal through the openings in the bottom of the concrete bin. These parts are so inaccessible that the only method of renewal or repair is to build them in the opening by welding, which is inconvenient and costly.

This difficulty does not apply to all designs of coaling plants for some chutes are bolted against the face of the concrete, with anchor bolts cast in the concrete. For this type, complete renewals may be purchased and placed without much delay.

Some coaling plants have undercut gates on their delivery chutes where non-skim-type gates may be preferable.

The requirements of coaling and sanding plants are almost as varied as their locations, and for this reason the local operating and mechanical personnel, as well as the bridge and building supervisory officers who will have the responsibility for the upkeep of at least the structural parts of such plants, should be consulted before construction or alteration is undertaken. If this is done, the inspection, operation and maintenance of each individual plant can be scheduled and planned in advance.

Inspection

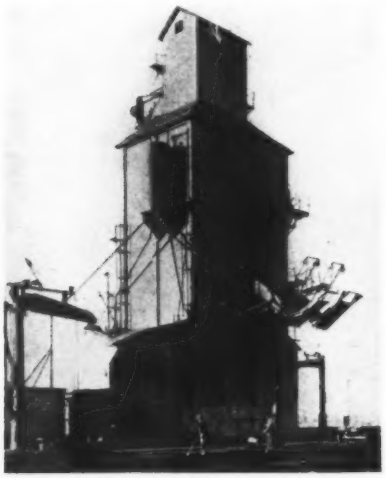
The inspection of coaling plants is one of the most important factors in the maintenance of this type of machinery. The maintenance of coaling plants is a divided responsibility. Where electric power is used, the electrician is responsible for the electrical appliances and, where gas or fuel ail engines are employed, the mechanical or water service department is responsible for the appliances; but in either instance structural repairs come under the bridge and building department. The mechanical department usually operates the plant.

Inspection should start at the bottom of the pit. See that coal is kept cleaned out in order that the counterweights and bucket bars have proper clearance to permit the feeder box gates and locking bar to function. Inspect all anchor bolts cast in the concrete to see that they are not rusting off.

See that feeder box supports under the lower end of the box are in good condition. There have been instances where, in the original construction, a wooden block was placed to support

the lower end of the feeder box and after several years this block rotted, transferring all the weight of the coal and box on to the cast iron door frame through which the coal runs from the pit into the feeder box. This caused the door frame to break, allowing the feeder box to fall into the pit, which resulted in serious delay to operations at this point while making repairs.

Check the cable for broken strands; also cable chip fastenings. See that coal dust is not accumulating under the undercut gates. In one case salt



Modern Train Schedules Require Careful Maintenance of Coaling and Sanding Facilities

was sprinkled in the coal in the winter to keep it from freezing in the feeder box, and the salt and fine coal packed under the undercut gate to such an extent that the heavy concrete counterweight would not move. Instead, it broke off the four anchor bolts that held the cable sheave, with the result that the concrete had to be cut away from around the four bolts and bolt studs welded on, which caused some delay in operation.

Inspect the counterweight and bucket cable for broken strands, and don't forget to examine the bolt and clevis on the bucket bail and counterweight bail, because failure of this clevis has been known to cause a long delay in operation as well as costly repairs.

It is not the intention of the committee to go into much detail with regard to the inspection, but rather to mention items that are vital to the safety and operation of coaling plants. Sheaves and pins should be watched and renewed when they show wear. Where castings and parts are bolted on, the bolts are of vital importance as they will rust off, and may let the apron or some other part fall without warning, with the hazard of injury as well as delay to operations.

All removable parts should be taken off once a year and coated with an acid-resisting paint or plastic compound; bolt threads should be cleaned and oiled before the nuts are replaced. This procedure does not seem to be general practice on all roads, but during present times it can well prevent serious delays.

The track department should check the track and keep it level under the aprons. If the tracks are not level, locomotive tanks will not take coal evenly and some coal will roll off to the ground.

One more important item to keep inspected is the beams across dumping pits. If these are neglected until they require renewal, costly repairs are required. The men working about the coaling station should clean these beams every month and paint them with a very heavy oil to keep moisture off the steel. The committee suggests that if any such I-beams have not been checked recently, this check should be made in order to determine whether corrosion has weakened these members to a point where their safety might be involved. This has happened in many plants.

The factor, above all other factors, that determines whether a road is getting out of a machine everything that was built into it is the general care that is given it. Careless neglect of a machine is inexcusable. It curtails its life, increases the frequency and cost of repair and robs it of its dependability.

First in importance in the servicing of a machine is proper lubrication. Most manufacturers of coaling plant machinery realize the importance of this so fully that they spend much time and money to design the lubricating system of their equipment properly and then determine the best kind, quality and grade of lubricant for each particular part of the machinery. If the builder makes specific recommendations regarding the lubricant to use, it is only fair to him, to the machinery and to the railroad, that these be followed.

The petroleum industry has made marked advances in the development of lubricants and we can be assured of good results if we use the proper lubricants. Machinery should not be run until it develops noise in order to warn that it needs lubrication, but it should be gone over thoroughly at regular intervals and be well lubricated. Equipment should be kept clean. Although a coaling plant is subject to an accumulation of coal dust, this should be kept cleaned off as much as possible and not allowed to penetrate into the wearing parts. All parts subject to corrosion should be kept painted or otherwise protected to prevent deterioration. On most railroads it is the duty of the operator to see that the machinery receives the proper servicing and care. This feature should be checked frequently. Cleanliness is a good indication of proper care.

Sanding Plants

Some type of sanding plant is usually provided in connection with almost every coaling plant. Some are crude and others modern, but all of them have some type of sand drying stove or coils. In some of the older type, sand is shoveled into the sand dryer hopper and is then transferred into the sand dome of the locomotive with pails; in others, sand is shoveled into the dryer and then shoveled into a steel drum and elevated by compressed air to sand storage tanks, where it is finally drawn off by gravity into the sand dome of the locomotive. In the more modern type, sand is placed in hoppers above the sand dryer by crane and bucket and the dry sand runs by gravity into the steel drum, from which point it is elevated by air to the steel storage tank, which is usually located on a platform on the side of the coal dock, from which it can be drawn by gravity to the sand dome of the locomotive.

The problem of inspection and maintenance is very important as the sand drying stoves or coils have an important duty to perform. During the present war emergency, the demand for dry sand is greater than ever before, and the sand drying equipment has to be forced more generally to its capacity. This makes it necessary to make more frequent inspections of the grates, fire pots, etc. The pipes through which the sand is elevated to the sand storage tank are usually two inches in diameter. In the past it has been a problem to keep these pipes from being cut out by the sand blast effect of the dry sand travelling through them at so high a velocity. At one time it was thought that good service was obtained if the couplings on straight lines would withstand thirty days' use; while the two-inch ells would cut through in about two weeks. This cutting of the ells has been overcome to a great extent by replacing them with a tee to provide a sand cushion, or by long bends to reduce friction. For couplings, extra heavy pipe is being used; the top end of the pipe is beveled from the outside and the bottom end of the pipe is beveled from the inside, and the two ends are screwed

into the coupling which forms a bevel joint. The sand flows through this joint without cutting. This type of joint will usually last about six months.

Supervision

A number of articles have been written about the qualifications of foremen who have jurisdiction over coal and sand plant operators, but they can be boiled down to this—he must know his job. A good foreman can size up his men and know where a pat on the back or stronger methods will do the most good. Both methods are necessary, but a good leader loves to praise and hates to punish. If good housekeeping is preserved and suggestions encouraged and given prompt attention, men will be proud of their job, and of their safety record.

Safety

The prevention of accidents constitutes a problem around any moving machinery; it is particularly true around coaling and sanding plants. Industry faces the problem of adequate man power; men who are entering new and unfamiliar jobs must be trained because the possibility of accidents is far greater in proportion than the increase in the number of persons employed.

Metal or other suitable guards should be placed around all moving parts of hoisting machinery and other units where there is danger of accidents. These guards should be so placed as not to interfere with the operation of the machine, but give the maximum protection to the operator. Grease and oils should not be allowed to accumulate on the floor where they might cause the operator to slip and cause injury.

Conclusions

Supervision is the prime requisite to the maximum use of coaling and sanding facilities with the least interruption or delay. Closer, more thorough and more frequent inspections are required to insure locating potential sources of trouble before actual breakdowns occur. The prompt correction of potential sources of trouble may avoid serious delays.

Cleanliness is a prime requisite in preventing interruptions, unnecessary wear and possible personal injuries.

Proper lubricants, in the right amounts, should be applied to parts subject to friction or wear. Too much oil or grease will cause accumulations which are fire and personal injury azards.

Eternal vigilance and close cooperation between all parties responsible for the maintenance and operation of coaling and sanding plants are needed more at this time than ever before.

Committee—A. L. McCloy (chairman) supervisor bridges and buildings, P. M., Saginaw, Mich.; B. F. Francis (vice-chairman) supervisor bridges and buildings, N.Y.C., Jersey Shore, Pa.; P. L. Koehler (vice-chairman) division engineer, C. & O., Ashland, Ky.; F. R. Spofford (vice-chairman) bridge and building supervisor, B. & M., Boston, Mass.; L. Clapper, assistant chief engineer, D.M. & I., Duluth, Minn.; D. W. Converse, assistant engineer, A.C. & Y., Akron, Ohio; L. A. Cowsert, water inspector, B. & O., Dayton, Ohio; V. E. Engman, chief carpenter, C.M.St.P. & P., Savanna, Ill.; W. K. Manning, general foreman, Erie, Cleveland, Ohio; L. R. Thompson, supervisor bridges and buildings, M. & St.L., Oskaloosa, La.; H. D. Tubbs, resident engineer, P. & M., Detroit, Mich.; H. A. Wistrich, assistant chief engineer, L.V., Bethlehem, Pa.; and J. F. Zanolio, master carpenter, D. & R.G.W., Grand Jct., Colo.

Men—How to Secure and Hold

Report of Committee

M. D. Carothers
Chairman

ONE of the most critical problems confronting the railways today in their efforts to meet the heavy demands of war transportation is their inability to secure sufficient labor—labor to replace losses to military service and war industries, and labor to increase the size of their crews to the point necessary to meet the largely increased demands being made for service. According to the latest report of the United States Railroad Retirement Board, dated September 1, 1943, the personnel needs of the railways in all departments, as reported to the Board by 193 roads, including the 30 largest railways of the country, reached a new high of 96,361, an increase of approximately 17,430 over the shortages reported a month earlier, and an increase of 55,451 since December of last year. No one need be told that such a situation is serious, especially with the prospect that, in spite of all efforts to the contrary; it will become still more serious.

The same report of the Board for September 1 shows that of the 193 roads covered, more than 70 reported shortages in bridge and building employees, ranging up to 50 per cent of their present requirements, and totaling approximately 4,200 men, or about one-ninth of the total number of bridge and building employees on the railroads in normal years. Among those classifications showing the largest shortages are carpenters —1,043, carpenter's helpers—325, bridgemen—58, bridge and building helpers—1,139, bridge and building laborers — 499, mechanics — 340, painters and painter's helpers—273, and water service men—103.

That this shortage prevails is not surprising. In the first place, the bridge and building forces have contributed their share to the armed services. Then too, composed largely of skilled men, they have been sought by war industries and military projects that have been in need of such men, and that have often held forth the inducement of subsantially higher wages. The losses that have been sustained in manpower are serious enough in themselves, but they are made the more serious by the shortages prevailing in many of the materials, and in work equipment, that are essential to the efficient repair and maintenance of all classes of railway structures. Adding to this is the increasing difficulty of finding con-

Women Can Be Employed to a Limited Extent in Bridge and Building Wood-Working Shops

tractors who will undertake railroad work, many of them facing the same manpower shortage as the railroads themselves. This overall labor problem of the bridge and building forces is one which they alone can solve, and they must solve it to the greatest possible extent. To do this will require the utmost effort on the part of everyone in the department.

Fundamentally, the solution of the problem lies along two lines—the securing of additional manpower wherever possible, and the holding of present forces. These, in themselves, present difficulties, first because of the serious defficiency in the overall labor pool of the country, and second, because of the demands of the military forces for more men, now including the younger married men, and the inducements, often temporary in character, that are still being offered by war plants and other industries competing for the still employable labor of the country.

Must Seek Men Diligently

How can new men be attracted to bridge and building work, and what means are available to prevent or discourage deflections from the present ranks of bridge and building men? Discussing first means of attracting the needed men to fill out the bridge and building forces, it is axiomatic that men will not be attracted who are not aware of the various positions open to them in bridge and building work, or who are not sufficiently apprised of the advantages inherent in employment in such work. The day when an adequate number of men present themselves to the railways seeking employment is past for the duration. Today, the railroads must seek out the men they need. They must do more than that in most cases —they must bargain shrewdly in the available labor market with other industries which are diligently searching for manpower—not necessarily on a dollars and cents basis, but on the basis of all of the advantages that accrue with railroad employment, and there are many.

In normal years of the past, needed additional manpower in the bridge and building department has been acquired largely through the interest and effort of bridge and building foremen and their men in contacting relatives, friends or acquaintances. While these measures have proved adequate under many situations in the past, it has become increasingly evident that to secure the necessary men today, the efforts made will have to go beyond these two measures to include intelligent, informative and appealing advertising in local newspapers, and a concerted effort on the part of foremen and their men to seek out for employment not only available men from among their friends and acquaintances, but desirable men anywhere in their communities. Advertising their needs is most important. Every metropolitan and town newspaper in the country today contains column after column of "help wanted" advertisements, placed by industries that are sparing no expense in their effort to secure men. Furthermore, many of these advertisements list every conceivable advantage offered through employment in the companies concerned. Today, when additional manpower is so essential on the railways, and when the available supply is considering the advantages of jobs more carefully than ever before, the railways cannot afford to overlook this type of appeal.

It is a well-known fact that thousands of carpenters, plumbers, painters and embryo artisans of all kinds, who left their normal pursuits to work on army camps and other military projects, are again back in their local communities, employed on minor construction and repair jobs. Such men should be contacted and appraised not only of the needs of the railways for labor, but of all of the advantages that accrue through employment in railway bridge and building work.

It must not be left to these men to approach the railways of their own initiative. Rather, where the need is great, the loyal bridge and building men now employed on the railways must set out in a concerted effort, as a specific assignment, to contact every available steelworker, carpenter, painter or man capable of working as a helper. To the end of securing men also, they should keep track of local construction jobs, looking to the possible employment of the men who may be out of work upon the completion of those jobs. These efforts must not be hit-and-miss—they must be on an organized basis, taking some company time, if necessary, to cover the field thoroughly.

In addition to these efforts to fill out their ranks, bridge and building men should enlist the interest and active support of every station agent in the employment of men, and these efforts should be supported by placards displayed in every station. Furthermore, contacts should be maintained with local employment agencies and followed up closely. A few roads, discouraged with the results secured through labor agencies, have employed labor recruiters, these men working on a salary basis, plus expenses.

Supplementing these different efforts, the various departments of the railways should co-operate with each other to the fullest extent in helping to meet their manpower needs. If men apply for positions in the bridge and building forces who are not fitted for any of the classes of work that must be done by these forces, an attempt should be made to find whether they would fit into any of the other departments of the railroad in need of men. Likewise, no other department should dismiss from consideration applicants for work if there is a possibility that they could be employed constructively in the bridge and building department.

Still further supplementing these efforts to secure men, the facilities of the United States Railroad Retirement Board should not be overlooked. At all times, a road's specific requirements should be kept before this board. That it can be helpful in many instances is seen in the fact that as recently as last July this Board arranged for 29,276 placements on the railroads, and during August this number was increased to 36,090.

Change Standards of Employment

Contrary to practice in the past, the recruiting of bridge and building manpower can no longer be confined to skilled men between the ages of 21 and 45. Most roads have found it necessary to lower their age requirements and to raise age limits. The track departments of a number of

roads during the last summer made extensive use of boys below military age, with large success, demonstrating that many boys are capable of highly constructive work. Only a few roads have as yet attempted to employ boys in bridge and building work, but where they have been employed, their work is reported as satisfactory. One road has employed boys successfully in a variety of helper operations, and has found them agile and willing workers. Another road has found boys particularly helpful in painting work.

It is recognized that greater care must be exercised in the selection of boys for bridge and building work than is required for track work, because of the generally greater skill required in most bridge and building operations. However, it must be recognized that many boys have innate skill and precision, with special aptitudes for carpenter and general construction work. The problem is to search out these particular boys, and to interest them in employment during their vacation periods. Whether it would be practical to employ them week-ends during the remainder of the year, as is being done by the track departments of some roads, may be open to question, but, where the need is great and the character of the work lends itself, even this possibility of supplementing the output of present bridge and building forces should not be overlooked.

Employing Women

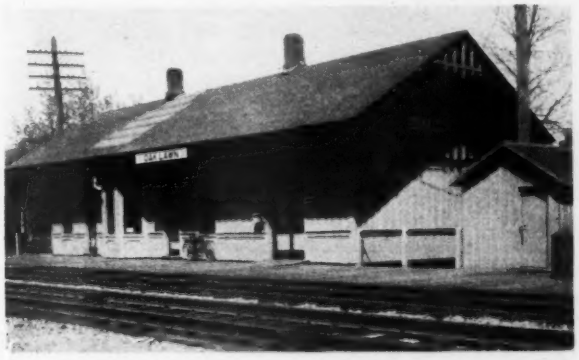
Few, if any roads have as yet attempted to employ women in bridge and building work, but some are seriously investigating the possibilities in this regard, particularly for certain classes of work carried out in bridge and building shops and in and about terminals. It is common knowledge that women are being employed in locomotive shops and enginehouses on many roads, with considerable success, taking over work that formerly was considered the province of men. It is likewise true that women are being employed in considerable numbers in maintenance of way work equipment repair shops, not alone in operations of secondary importance, but as mechanics, repairmen and machine operators. These facts, and the knowledge that hundreds of thousands of women are today being employed manually in industry generally, indicate that where the need is sufficient, the possibility of their being employed to help fill out bridge and building gangs—as helpers, as tool or machine operators, as painters and for clean up work about carpenter shops, should not be overlooked.

Still another possible source of manpower for certain classes of bridge and building work, although recognized as a limited one, is from the ranks of recently retired employees. Men should be encouraged to stand by their gangs as long as possible, or until the situation has eased.

Serious as are the needs of the bridge and building forces for additional manpower, one note of caution is in order. While it is not to be expected that under present conditions past standards as to age, skill, health and mentality can be maintained in seeking new employees, it is important that those who are brought into the bridge and building forces have the right attitude toward their work. Those of undesirable character, poor or unstable habits, and with discontented minds, should be avoided. Such men are trouble makers, and rather than a help, regardless of their manual skill, are demoralizing to an otherwise loyal and contented force.

Must Hold Present Employees

Important as is the need for securing new men to fill out the ranks of the bridge and building forces, it is no more important than that of holding on to those desirable men already in existing forces. Fortunately, most of the means to this end are common knowledge to those with any insight into human nature. Therefore, attempt will be made here only to review briefly the various factors involved and the means at hand.



Boys Can Be Employed for a Wide Range of Exterior and Interior Painting Work

At the outset, it must be recognized that labor today, more than ever before, seeks congenial and favorable working conditions, with adequate remuneration and minimum unnecessary inconveniences. This is particularly true of the higher class of labor that is needed generally in bridge and building work. Fundamentally, this calls for steady employment; for clean, sanitary and comfortable camps; for adequate, nourishing and well-prepared food in camps; for safe working conditions; for the greatest convenience in keeping in touch with their families; and for an attitude of fairness and consideration on the part of their superiors. With these conditions met, which are well within the realm of possibilities in bridge and building work, loss of manpower from existing forces, despite attractions of other industries, should be a minimum.

Stabilize Employment

Bridge and building work, as most other types of railroad work, has a fascination for many men, but fascination alone is not enough to hold most men under the conditions that prevail today. Most men of the type needed in bridge and building work want steady employment. Therefore, more than ever before, a serious attempt should be made to program work continuously throughout the year. Many roads have found that such work can be so planned with efficiency and economy, reserving for the winter months such work as heavy bridge repairs, the painting of building interiors and the repair of stations, freight houses, shops and enginehouses. As pointed out in an address before this association in 1941, by P. O. Ferris, chief engineer of the Delaware & Hudson, a road that has had remarkable success in stabilizing its forces, "It is essential that a road get a reputation for providing year-around employment."

Good Camps and Food

Where bridge and building men are required to live out on the line, away from their homes, they should be provided with suitable living quarters. Such quarters should be clean, sanitary, well-ventilated and capable of being heated comfortably in winter. Furthermore, it is desirable that they be provided with adequate room for recreation purposes; with shower

baths with hot and cold water; and with electric lights, either from portable electric generating sets or from available commercial power lines. Where cars are not available for such living quarters, consideration should be given to other types of living quarters, including the portable, readily assembled and dismantled buildings of various sizes and types that are now available on the market. These buildings, which can be transported conveniently from one point to another, should be handled readily by men acquainted with bridge and building work, and highly suited to their needs for convenience and comfort. In this regard, it is not without significance that one road has recently purchased 60 housing units of this type for section and extra gang labor, and has 20 additional units of this type on order.

Adequate, clean and nourishing food, rationing to the contrary, is just as important today as ever. As recent as October 6 of this year, the chief maintenance officer of an eastern road wrote—"We are firmly convinced that good food in liberal quantities, and clean, comfortable housing conditions are essential and attractive to labor." The railroads should render every assistance possible to the end that the men in their camps secure their fair share of the food that is available, and see that it is prepared and served in a sanitary, attractive manner. So far as bridge and building gangs are concerned, where the men generally arrange for their own food through a cook furnished either by themselves or by the railroad, this is a definite responsibility of foremen, master carpenters and bridge and building supervisors.

Convenient Transportation

Most bridge and building employees are family men. Those working in and about terminals desire to return home as soon as possible each night, and those out on the road desire to get back to their homes week-ends at frequent intervals. This desire on the part of the men must not be disregarded. On the contrary, every effort should be made to meet it. To this end, many bridge and building gangs are equipped with highway trucks, which enable them to work as far as 50 or 60 miles from their headquarters and to return at night. These same roads and others are liberal with pass privileges to employees desiring to return home week-ends, and both of these measures have been found highly effective in maintaining morale.

Holding employees also demands that the work be done safely. Few men today want to work where unnecessary hazards prevail, where safeguards are lacking, and where fellow workers are allowed to be careless, jeopardizing the safety of all. That bridge and building work can be done safely has been demonstrated unmistakably over the years. No railroad today asks its men to undertake unsafe operations. In fact, they have spent and are spending thousands upon thousands of dollars yearly to educate their employees in safe methods and practices. The extent to which these efforts prove effective is largely the responsibility of foremen, supervisors and master carpenters. They must see that adequate safeguards surround every class of work, that their men are dressed properly, that undue haste is avoided, that their men are instructed in the safe and correct methods of doing work, and that the careless habits of any of them are corrected promptly.

Must Offer Rewards, Incentives

With the profit motive instinctive in almost everyone, especially in times when living expenses and other obligations are on the increase, this motive cannot be overlooked. To increase the over-all income of those employees who desire such increase, many roads, in their urgent need for getting essential work done, are allowing these men to work beyond eight hours a day—some nine, some ten—at the option of the men themselves, paying them time and one-half after eight hours. Where this is desirable from the standpoint of the railroad and desired by the men, it is, unquestionably, a practice that will aid in holding some men who might otherwise be attracted elsewhere by higher wages.

Furthermore, in an effort to hold the better men in gangs, especially as men are lost to the armed services or other industries, consideration should be given to re-classifying or up-grading those men who remain, giving them the advantage of moving up to fill vacancies. Wherever this can be done on the basis of merit, it is in the interest of the men, the gang and the railroad, and should be done. At all times, those in the bridge and building forces should be made aware that there is a chance for their advancement—that a premium is placed on faithful and efficient service. To this end, foremen, and at least some supervisors and masters carpenters, should be promoted from the ranks, and every opportunity should be given other loyal and efficient employees to better their condition.

More than ever before, the morale of any bridge and building crew depends upon the foreman. He must have experience, intelligence, a good disposition, and unquestioned character. He must assume the responsibility of thinking for his fellow worker, keeping in mind that success in his work is primarily the art of transferring ideas from his head to the heads of others. He must be a good teacher. He must be confident in himself and stimulate confidence in his men.

Deferment of Essential Employees

Having given consideration to all of the foregoing factors in an effort to hold men, there is still one factor that has a fundamental bearing upon the holding of those men sought by the military forces. This is the seeking of deferment of those men who, either because of their skill or experience, are essential to the work that must be done. Rightly, the railroads have been reticent in asking deferment for any of their men below the rank of foreman, but as the drain upon these men has become increasingly severe, many of them have had to modify their practice in this regard in the interest of insuring the safety and adequacy of essential rail transportation. Where this is necessary, it must be done. In fact, it is the duty of the railways to seek such deferment for their essential employees. Authority for this latter statement is none other than E. M. Fitch, assistant director, Division of Transport Personnel of the Office of Defense Transportation, who said before the annual meeting of our association last year, in part, as follows:

"If you have men in these occupations (bridge and building and water service foremen, bridge and building ironworkers, bridge and building painters, pipe fitters, plumbers, timekeepers, welders and operators of the heavier types of portable equipment used in bridge and building operations) who might be placed in Class 1-A, except for their occupation, or whom you cannot let go because you are unable to replace them within a reasonable time, it is both your right and your duty to submit on Form 42-A all the data which the Selective Service System requires in making decisions as to occupational deferments.

"You should take Form 42-A very seriously and fill it out as completely and as fully as you can, making it apply as much as possible to the individual for whom you are requesting deferment."

Two other factors are mentioned in this report, not as in the direct interest of helping to secure or hold employees, but in the interest of the

equally important matter of getting the most effective work from those men already employed. One of these is the use of power tools and work equipment as widely and as effectively as possible to reduce the physical energy required to carry out necessary work, and to increase production per man-hour employed. This may be a greater factor than ever before as the average age of regular employees increases with the loss of younger men to military service and other industries, and as boys of less than military age, with limited physical endurance, are employed in the gangs of various types to help fill out the railway maintenance forces.

The other factor is that of protecting the health of every employee—first by measures on the job that will keep him physically fit, and second, by every means to restore him to health as rapidly as possible in case of illness. While the latter is not the direct responsibility of the railways, supervisory officers in the bridge and building department, including foremen, should make it their business to see that their men are adequately taken care of in times of illness, looking to their resumption of work at the earliest possible date.

M. D. Carothers (chairman), chief engineer, Alton, Chicago; E. E. Tanner (vice-chairman, water service), general supervisor bridge and building, N.Y.C., New York; Neal D. Howard (vice-chairman, buildings), managing editor *Railway Engineering & Maintenance*, Chicago; H. C. Crawford (vice-chairman, bridges), bridge and building supervisor, S.P., Dunsmuir, Calif.; G. S. Crites, division engineer, B. & O., Baltimore, Md.; Abraham Frazin, engineer draftsman, C. & N.W., Chicago; Garth H. Holmes, supervisor bridge and building, M.P., Falls City, Neb.; A. M. Knowles, engineer structures, Erie, Cleveland, Ohio; P. L. Koehler, division engineer, C. & O., Ashland, Ky.; M. Meyer, Sauerman Bros., Chicago; and Dee Worlow, bridge and building foreman, M.P., Kansas City, Mo.

Salvaging Bridge, Building And Water Service Materials

Report of Committee

H. Wuerth
Chairman

THE following statements are to be considered as applicable primarily to the conditions which the railroads face today in obtaining materials for new construction as well as for repair work. They also should be applicable, to a certain degree, during normal times. Our lumber supply is exhaustible; for that reason we must conserve it.

Salvaged or second-hand materials fall roughly into three general classes; i. e., (1)—those suitable for use in structures which are intended to serve a temporary purpose; (2)—those for use in structures intended to be continued in service indefinitely—material recovered is to be used in replacing similar material in like structures; (3)—that which will be sent to a mill or shop for sawing, milling or refabrication.

It must be borne in mind that all of the railroads have given a great deal of thought for many years to getting all the service possible out of timber and have used second-hand timber to a great extent. Today, with much of our lumber, hardware, water service material, etc., on the critical list, it behooves us to make greater use of second-hand materials than ever before. That is what we are all doing and it is certain that many a crew has been kept going this last year with salvaged material.

A proper slogan today is—*"Waste not, Want not."*

Bridge Materials

The careful and early planning of the season's bridge renewal and repair program can be very helpful in obtaining and utilizing good second-hand material for the season's work. By first working on the highest and longest bridges requiring out of face renewal, more suitable material will be recovered early in the working season for use in smaller structures. This fits in with a program whereby heavy renewals are made in the late winter, when little or no work can be done below ground line. Piles can be driven in the late fall or early winter and work on framing the deck can then be continued economically in deep winter as snow or freezing weather causes little interference with such work. Floors on long girder or truss spans can be renewed economically in midwinter. All this planning and execution of the work assure a generous supply of usable second-hand timber, consisting of pile stubs (new), second-hand piling, caps, stringers and ties. Brace planks and guard rails usually have little value except as blocking.

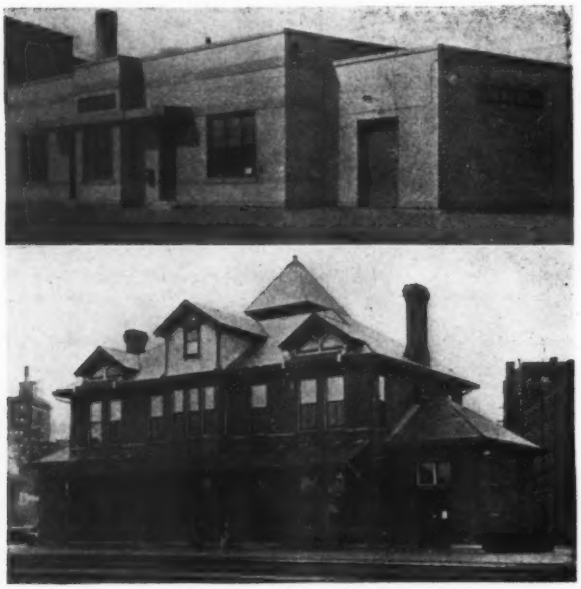
Piling—When redriving pile trestles, all new pile stubs or butts above cut-off are salvaged and can be used for many purposes in the work to follow. Their use depends on the lengths so salvaged.

Short pile stubs make excellent posts under freight house platforms, stock pen platforms and chutes (both loading and unloading) and under buildings of all kinds where the floor is at car floor height with post and sill construction underneath. Long pile stubs can be used for posts in frame bents in track bridges and in overhead highway bridges, especially in dump and shallow bents.

Old piling cut off at the ground line after a new bridge is placed in service can be used in a similar way as new pile stubs. In addition, because they are usually longer, they can be used as posts in replacing defective piles in bents and as posts in high frame bents in both track and highway bridges. Some use is made of them as fence posts by sawing them to seven or eight-foot lengths and then splitting them in quarters or eighths, depending upon the cross section of the pile. One railroad reports that salvaged cypress and cedar piling are sent to the mill for sawing into lumber and shingles.

Caps—Caps recovered in renewals

in kind usually are not all in poor condition. Some can be reused as caps in replacements on secondary lines and as caps for temporary falsework. Others make suitable blocking in raising bridges. Still others can be cut up, eliminating the unsound wood, and used as corbels, short blocking or posts. In cases where long caps are renewed on pile piers under steel spans, standard caps for trestles can be sawed out of old caps and reused in cap renewal programs.



The Two-Story Brick Building (Below) Was Remodeled Into a Modern One-Story Station and Office Building (Above)

Stringers—Stringers recovered in renewals have many uses, depending on their condition. The better ones can be used as helper stringers, sometimes known as strengtheners. The next best can be used as backwall or bulkhead timber. Others can be sawed up, destroying the poor wood but using the short, sound pieces for blocking, sills under posts and frame bents. Many stringers can be reused as stringers in the construction of farm road and minor public highway bridges over streams that are maintained by the railroad.

Ties—Ties recovered from pile trestles or girder or truss spans in 8-in. by 8-in. or 8-in. by 12-in. sizes, 10 to 12 ft. long, can be reused in a season's work in many different ways. The better ones make excellent blocking, bulkhead timbers, floors on minor bridges (highway or private) over streams, timber retaining walls, sluice ways, linings or tunnels through embankments when placing pipe, etc. Bridge ties make excellent material for cribbing at washouts, for they are light and easy to handle. It is important that poor ties be culled out and only the better ones kept for the work in hand.

All Timber and Piling—All timber and piling recovered from bridges renewed in kind, after the sound timber is picked out, have another potential value. They can be milled to sizes that can be utilized for building work—stock pens, platforms, concrete form bracing, shoring, blocking and for innumerable other purposes, in addition to use in the sizes recovered. All sound timber which cannot be used in repair programs should be sent to a central point where it can be sawed into dimension lumber. All salvaged material must be inspected carefully for termites. Under no circumstances should it be shipped elsewhere if infested with that pest.

Hardware—Packing, drift, guard rail and brace bolts should be sorted carefully and the scrap material discarded as scrap while the usable bolts are reused. Packing bolts will possibly require rethreading before reuse; others can be cut up and made into machine bolts. Still others can be remade into drift bolts. All packing washers (cast) must be saved and reused where practical. O. G. and recess washers must be saved. In bygone days much of this kind of material was carelessly thrown or dropped into rivers and creeks. Today it is not only good practice to save it as it may not be available in new material allotments on account of priorities, but it is also patriotic to save and collect scrap and we certainly do not want to run short of scrap.

Steel Girders and Trusses—In the salvaging of steel girder and truss bridges, much has been accomplished on many railroads in reusing light steel structures on secondary lines. The refabricating of girders for other uses has often been resorted to as new material was not available. Girders have been disassembled and the recovered materials used for strengthening and repairing other girders and trusses in track.

Building Materials

Much is being accomplished by various railroads in recovering and reusing building materials. Large, cumbersome (in many cases two-story) combination freight and passenger depots are being torn down and, with the help of some new finished lumber, smaller and more modern depots are being built. In many cases second story living quarters for either station help or section help are no longer used as living quarters. When vacant, such places become a fire hazard as well as a catch-all for the storage of materials that should be either used or sent to storage points where it will be visible to the eyes of the alert supervisor. Other facilities, such as roundhouses, stock pens, freight platforms, coal and oil houses, when retired and removed, build up large stocks of usable materials for making repairs to similar structures.

In recovering and reusing building materials, there is a great opportunity not only to devise more economical salvaging methods, but to exercise ingenuity in finding uses for everything that can be salvaged. Careful dismantling will produce much usable lumber in the larger dimensions, such as sills, joists, rafters, studs, girts, etc. The lumber so recovered is just as good as, if not better than the new material now furnished.

When dismantling a building, each member should be removed carefully and nails withdrawn. The materials should then be placed in piles according to dimensions, scrap and usable being separated. Any decayed or damaged ends of boards or timbers should be cut off and burned during the dismantling operations. In many instances it has been found possible to obtain quantities of nails from salvaged lumber, which are suitable for reusing in smaller structures. All nails, spikes or bolts not suitable for reuse should be sent to the scrap bin.

Millwork, such as doors and door frames, windows and window frames and sashweights, if found in satisfactory condition, can be recovered and reworked into other buildings. General hardware, such as locks, latches, hinges, etc., affords an opportunity for badly-needed critical material to be obtained from salvage operations. Roofing materials, such as asbestos, tile or metal shingles, can be salvaged and reused by the exercise of proper care.

When designing a new building,

much thought must be given to the materials available from salvage operations. It often happens that by sawing the heavier members recovered into lumber of smaller dimensions—for example, 4-in. by 4-in. studs to 2-in. by 4-in. studs, 2-in. by 8-in. rafters to 2-in. by 4-in. studs, and 6-in. by 8-in. and 8-in. by 12-in. timbers into 2-in. by 8-in., 3-in. by 8-in., 2-in. by 12-in., 3-in. by 12-in., etc., joists or rafters. As a rule, the new design of the depot will call for concrete foundation walls and floor, which releases all the heavy floor timbers, including beams, joists and floor plank.

One of the accompanying illustrations shows a remodeling job before and after, in which a two-story brick building was remodeled into a modern one-story station and office building. Lumber and brick recovered in the dismantling were used almost exclusively in the finished structure. In another case, a freight house was remodeled, the new roof covering being entirely of asbestos shingles recovered from various dismantled buildings.

Another outstanding example of effective remodeling is the case of a present small snug wayside freight and passenger depot, which was constructed from materials recovered in dismantling an old large, oversize freight and passenger depot. The structure before remodeling was 24 ft. 6 in. by 74 ft. in area, on a post foundation, with a floor area of 1812 sq. ft. After remodeling, the depot is 16 ft. by 38 ft., on a concrete foundation, with a floor area of 608 sq. ft. Wall plates, studs, rafters, roof boards, sheathing, V'd ceiling and the freight room floor were recovered from the old depot and reused. Not only has this road now a new depot, built with 75 per cent of the lumber second-hand, but it has a depot only one-third as large to maintain.

Again, as with salvaged bridge lumber, materials must be inspected carefully for termites; termite-infested material should not be shipped to non-infested areas.

Water Service Materials

Much of the material used in railroad water service work is on the critical list, so that every effort should be made to salvage and reuse such material, not only in the interest of economy but as a patriotic duty in the present emergency. It should not be necessary to enumerate all the items of materials and equipment that may be salvaged and reused as is, or after reconditioning, but some of the larger and more important items are as follows:

Pipe and Fittings—The salvaging of abandoned underground pipe lines and fittings has been promoted extensively within the last year. Cast iron, as well as wrought iron pipe in 4 in., 6 in., 8 in. and 10 in. sizes have been salvaged, in many cases at costs less than the present market prices. Other operations of this kind cost more but new pipe is not available on account of priorities. When the wrought-iron pipe is found pitted, the poor sections are cut out and scrapped and the good pieces welded together to provide required lengths for the repair or renewal of other lines.

Much steam, water and gas pipe, with fittings, has been recovered from abandoned buildings and reused for repair work. Almost all types of hot water and steam radiators can be reassembled in units of the sizes needed for heating purposes. Boilers, fittings and accessories, hot and cold water pressure valves, relief valves, steam traps, etc., are susceptible to salvage and repair with good parts from similar equipment. To a somewhat lesser degree, the same is true of plumbing fixtures and fittings. Entirely new assemblies have been made from such salvaged materials.

Many gate valves are salvaged, which require only cleaning and oiling. Globe valves are shipped to shops for reseating and changing out discs.

Water Tanks—Water tanks, when renewed, usually release hoops, staves and floors, which can be reused either for repairs or for the construction of new tanks. When the threaded ends of hoops are in poor condition, they can be reconditioned by cutting them off and welding on new pieces to be rethreaded. In some cases, recovered staves and floor lumber can be reused by cutting them down to the lengths required for smaller tanks used in bridge and building or extra-gang camp outfits. Tank spouts, with fixtures and outlet valves, are salvaged and reused.

Water columns, where replaced with larger columns or retired, should be sent to a central point or storehouse where they can be reconditioned and sent out again as needed. Much has been accomplished with the efficient welding facilities that we now have. Water column stands and bases, when broken, can be kept in service by welding. This is true also of the water jackets of pumps and engines, and the bases for motors and engines.

Electrical appliances, such as starter switches, automatic control devices, etc., all critical, can be repaired with parts taken from salvaged appliances. However, care must be exercised when reusing wire and conduit to comply with fire underwriters specifications.

H. W. Wuerth (chairman), division engineer, C. M. St. P. & P., Savanna, Ill.; E. H. Barnhart (vice-chairman), division engineer, B. & O., Garrett, Ind.; W. A. Huckstep (vice-chairman), general bridge supervisor, M. P., St. Louis, Mo.; Maxfield Bear (vice-chairman), estimator, C. & N.W., Chicago; John E. Bird, bridge and building inspector, N.Y.C., Corning, N.Y.; R. W. Cook, general bridge inspector, Seaboard, Norfolk, Va.; J. B. Lodeski, assistant general bridge inspector, C. & N.W., Chicago; G. L. Sitton, chief engineer, maintenance of way and structures, Sou., Charlotte, N.C.; M. P. Walden, assistant supervisor bridge and building, L. & N., Evansville, Ind.; L. G. Byrd, supervisor, bridge and building, M. P., Poplar Bluff, Mo..; R. H. Morrison, superintendent bridge and building, Bang. & Aroos. Houlton, Me.; and Alfred G. Rose, scale and bridge inspector, M. P., Osawatomie, Kan.

Every Effort Must Be Made to Salvage and Re-Use All Usable Bridge Steel and Timbers

Discussion

S. T. Corey (C.R.I.&P.) inquired how far north termites were prevalent, to which W. A. Huckstep (Mo. Pac.) replied that they were first observed along the coastline in the Southern part of the United States, but have gradually worked north until now they can be found in every state in the United States. Mr. Huckstep added that there are about 1,900 varieties of termites known in the world, of which about 127 varieties have

been discovered in this country. Of these, only three, the dry-wood termite, the powder-post termite and the subterranean termite, cause much damage. The latter, or subterranean termite, is the one with which we are most concerned. Termites are insects of the cockroach family, he added, and each group or nest has three types; workers, soldiers and reproductive termites, of which the latter stay in the nests underground.

Mr. Huckstep also stated that he had recently examined a building in the south, built 41 years ago, in which the termites, which had seriously damaged the building, had eaten the studs and even the lath under the plaster.

Securing Maximum Utilization of Work Equipment

Report of Committee

D. T. Rintoul
Chairman

RAILROAD operation presents problems today that are more difficult and complicated than any ever before faced by maintenance men. War conditions have resulted in an unprecedented volume of traffic which must be handled without interruption or delay. Manpower, particularly that skilled in maintenance work, must be used judiciously because of its scarcity. Some materials are not available for maintenance work, even if priorities are obtained, which fact results frequently in the necessity for using substitute materials for repair work. Many types of mechanized work equipment cannot be purchased and the best possible use must, therefore, be made of the equipment that is available, even though much of it may be obsolete. Equipment must be maintained in the very best condition so that it will involve no serious breakdowns or interruptions to the work.

To add to this problem, the depression years preceding this war left their mark on the railroads. Many structures that, in ordinary times, would have been completely renewed, have been kept safe and continued in service by making repairs, even though this was not "long run" economy but was merely postponing major work that would have to be performed later. This repair or "patchwork" has added to the present problem and the conditions are now such that the practice of "repair" work must often be continued.

Programming the Work

The conditions under which the railroads are operating at the present time, and the necessity of getting the greatest continuous use from equipment make the annual bridge inspection more important than ever. On this inspection there must be determined not only the work that is to be performed, but also when it should be done. Work must be planned in an orderly way, if present equipment is to be used to the utmost and movement from job to job must be held to a minimum. In other words, equipment should be assigned to the jobs of the longest duration, thus reducing, wherever possible the time lost in moves between smaller jobs. In addition, maintenance of structures work should be planned whenever possible, so that it can be accomplished by methods that do not require the use of work equipment, thus conserving the equipment available for work that cannot be undertaken without its use. This may mean going back to methods in effect years ago, but which may prove of advantage under present circumstances.

Interruptions to traffic and slow orders must be avoided today more than ever before, and work must be planned in such a way that they will be kept to a minimum. Division and system maintenance and engineering officers have the responsibility of planning the larger items of work, but the bridge and building supervisor usually has the responsibility of seeing that the proper tools and mechanized equipment are on hand.

Classes of Equipment

Mechanized or power equipment can be divided into three classes—(a) "On-track" heavy equipment, such as pile drivers, locomotive cranes, ditchers and even outfit and motor cars; (b) "Off track" heavy equipment, such as crawler cranes, bulldozers, compressors, etc., and (c) small power tools, such as jackhammers, paving breakers, power drills, saws, etc.

The use of "on-track" heavy equipment, under present day traffic conditions, should be restricted as much as possible. The "on-track" pile driver, when not in use, should be stationed at one of the principal shop areas of a division, to be sent out only when needed by a gang. Like the relief derrick, a pile driver must be kept in good mechanical condition, ready for use in any emergency.

The locomotive crane greatly assists a depleted gang in handling heavy materials and in doing pile driver jobs or clamshell work. When a crawler crane is not available, it is often necessary to use a locomotive crane, but, in that event, there should always be a spur track available close to the work so that the crane may clear the main line quickly and not interfere with traffic. When not in use, a locomotive crane should be employed in a material yard.

The crawler crane is a valuable unit, since it can be kept clear of the track. When sent to a job it should be loaded on a flat car, together with slings, chains, nets, clamshells and a ramp for unloading, so arranged that they can be unloaded with the least possible delay.

Assigning Heavy Equipment

In assigning heavy equipment to gangs, consideration must be given to the greatest possible use of the various machines. Forces working on steel bridge repairs should be provided with the complete outfit necessary to perform the work most efficiently. System gangs that erect or dismantle steel bridges, make heavy masonry repairs, do extensive temporary trestle or falsework construction or out of face renewals of large timber structures, must be provided with cranes for handling heavy materials as well as for driving piling.

Particular attention must be given at all times to a scheduling the work at times when train movements will interfere the least.

The concrete mixer is an "off-track" unit and in assigning such equipment, mixers of the proper capacity should be used, depending on the size of the job. A mixer too large or too small is uneconomical. It is seldom that any jobs performed by maintenance forces require more than a seven-sack mixer and in many cases a one-sack or four-sack mixer has been found most valuable. It is the function of the bridge and building supervisor to determine what size will be most economical and to ship this mixer to the gang as needed. It is important that the mixer be cleaned after each day's work and that it be kept in good running condition.

Air compressors, like concrete mixers, should be available in various capacities in order to secure maximum efficiency. Although it is only in recent years that the compressor has come to be recognized as a valuable general utility tool, it has now become indispensible. If possible, the compressor should be transported by truck rather than by train. On some railroads one or more compressors are mounted on a truck and assigned to the bridge and building department. Mounted in this manner together with a few air-operated tools, hose and accessories, and going from job to job as assigned, this tool will soon save its cost. This manner of transportation is a practice which contractors use to advantage and one which the railroads might well follow to obtain greater flexibility in the use of road tools. Because compressors, in conjunction with various air tools and equipment, can be used for excavating, tamping, boring, hoisting material with an air hoist, painting, cleaning, riveting, pile driving, operating pumps and jets, and many other uses, they have become one of the most valuable units in an outfit.

Pumps

One noteworthy advancement in the equipment used by a bridge and building gang is the water pump. Old timers will recall the cumbersome and inefficient pumps that were formerly used; in comparison, the modern compact direct-connected and self-priming pumps are very satisfactory. Small, portable gasoline motor-driven trench pumps are an important aid to the modern bridge and building gang. These pumps should range in size from 2 in. up to 4 and 5 in. They are easily transported and while their use, of course, is restricted to the pumping of water, their utility has given them a greater field of service than was formerly the case. This equipment is interchangeable so that a gang can readily secure a pump of the proper size by exchanging with another gang.

Smaller Equipment

Smaller equipment, such as jackhammers, paving breakers, air augers and spades, has established its place in the list of necessary equipment. The greatest difficulty with such

Numerous Types of Small Air-Operated Tools Are Standard Equipment on Many Bridge and Building Gangs

equipment is in procuring it and in keeping it readily accessible for use when required.

The air spade is indispensable for tunnel work and drain tunnel work because of its light weight and ease of handling in overhead work. It can be used both as a spade and as a gad.

The motorized or air auger does the work of ten hand-operated augers under normal conditions. Such savings in time and manpower are of the greatest importance in renewing bridge decks quickly and thereby avoiding slow orders.

A power cut-off saw will save at least two-thirds of the man-hours formerly required in this work.

Air Tools

The air hoist has many uses, such as handling materials. It is frequently used in tunnel work for pulling out muck cars and buckets. Air hoists having a capacity of 1,250 lb. at 80-lb. air pressure and using 225 ft. of ⅝-in. cable have been found invaluable for placing bracing, caps, etc., under bents and spans or in dismantling steel spans or falsework timber. The capacity of the air hoist may be increased by using small steel blocks.

Each division should have its allotment of compressors, mixers, generators and air-operated tools, but it is not advisable to pool a large number of small tools for too much time is lost in transporting these tools from a central location, parts become mislaid or lost in transit and frequently an entire shipment is badly delayed, depriving a gang of its use meanwhile.

A close check of gangs should be made frequently by the supervisor to determine what tools are idle or may be idle in the near future, so that they may be sent to gangs where their use is required.

Operation of Equipment

The proper operation and care of work equipment are essential to its maximum utilization. Capable operation carries with it minor details of every-day maintenance that, if promptly cared for, will prevent failures, with their resultant delays, and will increase the efficiency of the machine and prolong the periods between shopping for general repairs. Among these details of operation are correct lubrication, frequent inspection, the adjustment of moving parts as required and tightening loose bolts and nuts. The operator should have sufficient knowledge of the construction of the machine to detect readily any irregularity that might interfere with its operation and enough mechanical ability to make minor repairs and adjustments required to forestall breakdowns.

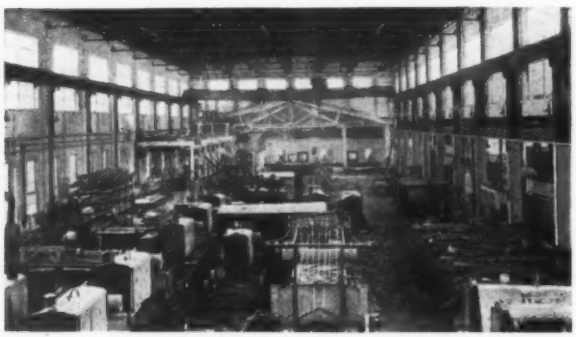
Some operators of work equipment have sufficient mechanical ability to make any field repairs that may be made by a regular maintainer. As a rule, however, the majority of the operators that are selected from a gang of bridge or sectionmen are able to handle only the minor details of operation. It is these details, however, that are responsible for failures of work equipment. For example, many failures arise because of fuel and ignition troubles; with the widespread use of the automobile, it should not be difficult to select a man from the gang who is familiar with these and other details of operation, which, if handled properly, will reduce failures and unnecessary repairs.

Maintenance of Equipment

The provisions for repairs probably comprise the most important factor in insuring maximum efficiency of tools. This is particularly true today in view of existing limitations on se-

curing new equipment. In the 1941 Proceedings of this Association, a committee report on the Maintenance and Repair of Bridge and Building Equipment covered the subject fully, but because of its importance at this time, your committee feels that it should be reviewed again.

The rules and instructions that govern the maintenance of heavy machinery, such as shovels, cranes, pile drivers, draglines, etc., are the result of years of experience accumulated by men handling this type of equipment. Copies of these rules should be given to and be understood by each operator responsible for the operation and field maintenance of a machine. These operators should report every ten days on the condition of the machine and repairs needed.



Much Time-Consuming Repairs in the Shop Can Be Minimized by More Maintenance in the Field

Lubrication

Machinery is usually lubricated with standard greases and oils supplied by the stores department, which should have a list of the various machines and the types of grease and oil they require. Special oils and greases are necessary for certain special machines and should be covered by instructions to both the operator of the machine and the stores department. If the standard list is departed from on the orders placed by the operator, the requisitions should be referred to the supervisor of work equipment.

The operators of cranes and other cable-operated equipment should be responsible for turning the cables end for end to change the locations of points receiving the greatest wear. These operators should make periodic inspections to determine when the cable should be turned. They should also watch traveling clutches and other points on the machines which are subject to wear so that corrections can be made before breakdowns occur.

The supervisor of work equipment or one of his assistants should make an inspection of such equipment every 60 days for the purpose of checking the operator on the upkeep of the machine and to determine the manner in which the operator is conducting his work.

Repair of Equipment

Machines should be shopped when the accumulated wear is such that field repairs will no longer assure continued operation. There is no specified time that a machine should be operated before shopping occurs. Machines should be completely dismantled when sent to the shop for repairs. This will disclose any additional repairs that may be needed. The work list of repairs that is sent in with the machine by the operator or by division authorities is usually incomplete and additional repairs and overhaul are usually necessary.

It is the responsibility of the shop to turn out a first-class repair job on any machine sent in for overhauling and unless a machine is completely dismantled and thoroughly reconditioned, successful operation cannot be assured. Boiler repairs on steam-powered units are usually handled by the motive power department, as they comprise specialized work requiring a skilled boiler maker and the use of tools that are not available to maintenance of way forces. Also many state laws require that boiler makers perform all work on pressure vessels of any kind.

Compressors, gasoline engines, concrete mixers, etc., as a rule, do not fail unless an accident occurs, breaking some part. Their efficiency, which is lessened as a result of continual wear, determines whether a unit should be sent in for general repairs. This also holds true for air tools and other small units, which are usually held in the field until their efficiency is impaired by excessive wear, at which time the units should be sent in for general overhaul.

When air tools of this type (including tamping guns, paving breakers, jackhammers, etc.) are sent in, the consumption of air should be checked before the tool is dismantled. This will provide an indication of excessive wear or of poor valves and will give the mechanic a clue as to the trouble he may look for when the tool is dismantled. By means of special tools and measurements, he can then verify what repairs are needed. The repair of this type of equipment necessitates having replacement parts on hand.

The repair of tractors requires special tools, which are usually furnished by the manufacturer. In order to lessen the man-hours required on a repair job, the shop should be equipped with such tools. The shop should also be equipped with the necessary machine tools; blacksmith equipment, including a power hammer for light work; a crane for handling parts, and the tools necessary for reboring cylinders, regrinding valves and line-boring bearings.

From the reports made by equipment operators every ten days, a list of each piece of equipment, its location, and the work it is performing, can be compiled. This list should then be given to all officers who may be interested in the location of the equipment in order that its use may be scheduled most effectively. Likewise, in case of an emergency, any of these officers may refer to this list to determine the availability of almost every type of company equipment.

Conclusions

Summing up, the principal factors essential to maximum use and efficiency of work equipment in bridge and building work are: (1) The careful planning of the work, based upon an annual inspection, so that maximum use may be made of the equipment; and (2) the maintenance of the equipment in a good state of repair, as breakdowns are costly and faulty equipment leads to poor work.

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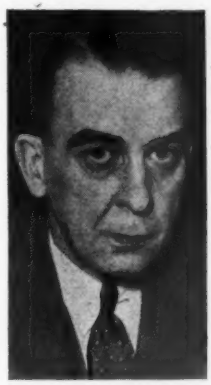
Revising Working Practices to Eliminate Interference with Traffic

Report of Committee



L. R. Lamport
Chairman

SINCE the first World War, there has been a general development of heavier locomotives capable of greater speed and with them improved rolling stock, roadbed and structures, all of which have resulted in a gradual shortening of schedules. These developments have been more pronounced following the depression years, in which period the railroads entered an era of speed in train operation—both passenger and freight.

Train Speeds Increased

In order to recover passenger business lost to other forms of transportation before and during the depression, train speeds were increased and the first streamlined train made its appearance in 1934. That train, with its maximum speed of more than 100 miles per hour, and other similar trains were accepted so readily by the public that this type of passenger service has now become commonplace. The shortening of schedules of trains with heavier-type equipment soon followed the advent of the lightweight train so that today there are few so-called slow passenger trains except on unimportant branch lines.

While perhaps not so spectacular as with passenger trains, the shortening of freight train schedules has been given similar attention in the interest of competition with other forms of transportation and recovery of business. As a result, maximum freight train speeds of 60 miles per hour are being maintained today on the more important lines throughout the United States and Canada, important regularly-scheduled trains making overnight runs between terminals 400 to 500 miles apart.

Previous reductions in train schedules have played no small part in the remarkable performance of the railroads since the attack on Pearl Harbor on December 7, 1941. With less equipment than was available during World War No. I, the railroads are carrying a greater volume of traffic, both freight and passenger, through increased speeds made possible by improvements in equipment, roadbed and structures.

Effect of Slow Orders

All who have the responsibility of maintaining structures under present-day traffic conditions must bear in mind that an unscheduled reduction in speed may mean a delay in arrival at the terminal, with far reaching effect on connections. With our nation at war, it is more important than ever that troops and war materials arrive at their destination on schedule.

In 1936, your committee on Adapting Bridge Maintenance Methods to Today's Requirements for High Speed Train Service referred to tests made by the Pennsylvania to determine the value of unrestricted track in its high speed electrified service between New York and Washington, as follows: "In making these tests, a 30-mile restriction was placed on one half mile of track at various places to obtain different combinations of grade conditions. On level grade, if the reduction was from 75 miles an hour, it required 3.14 miles before full speed was again attained. From 90 miles an hour, this distance was increased to 6.14 miles. When the restriction was on an ascending grade of 0.4 per cent, these distances were 3.81 miles and 12.12 miles respectively. These data showed that if speed restrictions are to be placed from 5 to 12 miles apart, depending on grades which do not exceed 0.4 per cent, there will be no advantage in raising the maximum speed."

The data obtained from these tests, carried out under favorable grade conditions, make it readily evident that reductions to speeds of 10 or 15 miles an hour from high passenger or freight train speeds, particularly with unfavorable grades, mean losses in time which may not be recovered.

Traffic Must Be Considered

While it is recognized that bridge work cannot, in all instances, be carried out without interference with traffic, continued effort on the part of engineers and supervisors to revise working practices in the construction and maintenance of structures has done and will do much to shorten the period of time that slow orders are required, or eliminate them altogether. In order to accomplish the desired result, traffic conditions must, together with economy, be given first consideration by those in the field when making recommendations for improvements or repairs. Field surveys must be in sufficient detail to give the designer all the information necessary to enable him to develop plans for a new structure so that the construction work may be carried out with the least interference with traffic.

On the more important structures, after plans are completed, a definits schedule for carrying out the work should be made and studied in conference, preferably at the site, by the bridge engineer or his representative, the division engineer, and the supervisor, calling in a representative of the operating department for information on train movements and schedules. Such a conference may result in changes before the final plans are made, but it will reduce traffic delays to a minimum.

While the design of a structure exerts a very definite influence on the elimination of interference with traffic, close field supervision and contact with the work are of first importance. The supervisor must be in constant contact with his crews and train them to meet the conditions that arise on their respective territories. He must have a thorough knowledge of train operation and be in constant touch with the dispatchers and other operating officers to insure that working schedules are made to fit traffic conditions.

On some railroads, high speed streamlined trains operate on other than daily schedules: and there are instances of important high speed freight trains which do not operate daily. With a thorough knowledge of such train schedules as these, and

through taking advantage of them in programing the work, traffic interference may often be avoided entirely on projects which would otherwise require slow orders.

The furnishing of crews with improved power tools and newly-developed machines has contributed greatly toward the reduction in the time required to perform work, with the result that traffic interference on structures where this equipment is used is held to a minimum. Compressors of the type requiring long pipe lines are being replaced by more compact portable types mounted on rubber tires. Improved air tools including drills, impact wrenches, rivet busters, rivet hammers, etc., have been made available for steel bridge crews. Likewise, air saws, wood borers, and wrenches are being provided for crews performing work on timber bridges and timber decks on steel structures.

Many roads are equipping their crews with electric generator sets of various capacities. Some of these are of sufficient size to operate a wood borer, a circle saw, and also a large chain saw for cutting stringers and other large timbers and for making pile cut-offs. Gasoline-driven flexible-shaft power units equipped with wood borers, wrenches, and saws have now been in use a number of years and can be adapted readily to bridge work, particularly for deck renewals. The carrying by crews of cumbersome jacks, with the loss of time incurred by their use, is no longer necessary for developments in this tool have been such that a suitable number of jacks of an efficient type can be had by each crew without over-stocking the tool car.

Modern work equipment, including pile drivers, locomotive cranes, and gasoline driven cranes, has to a great extent replaced obsolete equipment, with the result that the time required for performing work is reduced to a minimum. The drop hammer driver has been almost entirely supplanted by the steam hammer and the derrick car is gradually being replaced by modern locomotive cranes. Such cranes, equipped with steam hammers, are being used for driving piles, particularly concrete piles, on account of their greater capacity.

Traffic Interference at Points of Bridge Work Must Be Avoided and Slow Orders Kept to a Minimum

Handling Materials

Where there is a sufficient amount of material to be handled to warrant, a small gasoline crane with transverse wheels to enable it to be taken off the track at the bridge site, may be employed to advantage. While this crane does not require a work train, it does require a pilot, a conductor, and a locomotive engineer on most roads today to comply with labor agreements; and that feature may preclude its use because of additional expense.

While not used extensively, such off-track equipment as cranes and shovels may be employed in excavating, handling material, driving piles, and other work. The greater utility available from off-track machines, where they can be adapted, tends to speed up the work and shorten the periods during which slow-orders may be necessary. Where a sufficient depth of water is available, floating equipment may also be advantageous in eliminating traffic restrictions.

The motor truck has done a great deal to eliminate train service in handling material. Whether a work train is used or the material is unloaded from a regular train, there is usually some interference with traffic which may not be necessary if a truck is available. With present highways, a truck can now reach many of the structures and can be used to advantage, unless a sufficiently large amount of material is involved to warrant train service.

Welding

Developments in the use of the cutting torch and of acetylene and electric welding have done much to speed up bridge work. The cutting torch is invaluable to steel erection crews in carrying out their maintenance programs and can be used to advantage by bridge crews, particularly for cutting bolts, providing proper precautions are taken to prevent fires. While welding has not been developed to the point where it is accepted universally, it is being used extensively for miscellaneous repairs to steel bridges. Its use is readily adapted to repairs to plates and connections where members are not subject to high stresses.

The use of welding in making repairs to the machinery of movable spans should be considered. One road reports that by this means it built up bearing surfaces of gears in drawbridge machinery and thus eliminated the necessity of replacing the gears, which replacement would have required restricted speed over the structure.

Treated timber has been a very considerable factor in reducing traffic delays, by reason of its longer life and less frequent renewals. With the development of treatment has come a trend toward preframing and boring to increase the life of the timber still further. While not adopted universally by all railroads, the majority of them are using preframed timber to some extent, with considerable saving in the time required for its application thus cutting down the period during which restrictions to traffic may be necessary.

Much has been accomplished in the practice of placing culvert pipes in fills without the necessity for open trenches and falsework. Soil conditions permitting, pipe up to 72 in. in diameter can be jacked efficiently and pipe in excess of this diameter may be placed by tunnelling without appreciable disturbance of the roadbed or interference with traffic. Concrete pipe chosen for jacking operations should be tongue-and-groove, rather than bell-and-spigot type. Jacking of pipe requires no special equipment except suitable jacks of sufficient capacity; but care must ge taken to provide well-constructed back stops against which the jacking is done in order that there will be no failure while the work is in progress which might permit the pipe to "freeze."

Precast masonry is used to a greater extent than ever before to reduce traffic delays or slow orders. Precast culverts, slabs, blocks or bridge decks can be installed in a few hours without appreciable traffic delays. The amount of falsework is also reduced as well as the length of time that that portion of the track is under restricted speed.

In general, the placing of permanent bridges of concrete or steel de-

sign, or their remodeling or renewal, requires the greatest consideration in the elimination of traffic interference. In nearly all instances, the installation of falsework or the diversion of traffic is necessary and the procedure must be studied carefully before the work is started and temporary structures or tracks well maintained in order that maximum safe speeds may be maintained.

Where falsework is used, it should be designed of sufficient strength for normal speed, if possible. During installation, inequalities in surface due to heaving while driving piles must be corrected immediately. Further attention to falsework after installation will, no doubt, be necessary; and it should be watched carefully by the foreman in order that corrections will be made to line and surface, as demanded by traffic conditions.

Diverting Traffic

In multiple track territory, it may be found advisable to divert traffic through the use of temporary or existing cross-overs. This expedient will slow traffic down to some extent, except in restricted zones, for the reason that the maximum speeds permissible will be governed by the turnouts. Even when using high speed 1-in-20 turnouts, the permissible speed should not exceed 40 miles an hour.

The use of run-around tracks is adapted especially to places where slow speeds would otherwise be required for long periods of time. If well constructed and of proper curvature, traffic diversions should permit speeds up to 60 miles an hour. Such speeds can, of course, be attained only by throwing a track to the temporary alinement and avoiding the use of turnouts. Constant vigil by track and bridge and building forces in maintaining run-arounds is necessary to keep the new roadbed and structures in proper line and surface. Where a bridge is a considerable distance from a siding and too much time is lost in clearing trains, the construction of a temporary spur track should be considered as a means for reducing the time required for carrying out the work.

Concrete Piling

The concrete pile is being employed extensively for the replacement of timber structures; and, in some instances, for steel structures. The concrete piles have the advantage that, by varying span lengths, they may be driven and the work carried out with little or no falsework, regardless of whether the piles are to be used in single bents for concrete slabs or I-beams, or in multiple bents for piers on which to place girder or truss spans. In its earlier period, the concrete pile was made either square or octagonal and of about 16 in. dimension, five or six piles being driven per bent, depending on the loads to be carried. On open deck bridges, the use of this number of piles requires the shifting of the chords for driving, with the result that the driving period is lengthened by the necessity for opening and closing the bridge. Such opening and closing increases greatly the time required for the job and makes slow orders necessary for long periods, which slow orders are unduly restrictive to traffic.

A number of roads have overcome the objectionable feature of having to shift chords by designing larger piles (of 24 in. dimension) and using three of these piles per bent, driving one between the chords and one outside of each chord. The use of the larger pile requires only that a section of guard rail be removed at each location and that sufficient drift bolts and spikes be pulled to permit the shifting of a few ties. The bridge can be made ready for traffic while the pile driver outfit is running to a siding to clear the train and the ties can be reopened again by the time it returns. Some heaving may develop from the driving, but this can be shimmed out readily without excessive traffic interruptions.

While substructure work can, for the most part, be carried on without excessive traffic delays, superstructure installation or replacement often presents problems which can only be solved by the greatest amount of study and ingenuity in the development of methods, if the work is to be done within the limits permitted by train schedules.

Short spans—concrete slabs or steel that is easily handled—can usually be placed without interrupting traffic, providing sufficient consideration has been given to preparation. All adjustments possible must be made beforehand to avoid unnecessary shimming and lining during the work so that, on multiple span structures, the track can be closed to permit trains to pass without interruption of schedules. If adjustments will be required to connect new work to the old structure, this must be known in advance and the necessary men and material made available to handle the closure promptly.

Most roads have, for many years, been following the practice of placing long spans by erecting them on falsework alongside their final location, from which place they are rolled into place. In using this method, the deck and rails can be placed beforehand so that the track is out of service a minimum of time. With careful preparation for the movement and thorough study of train movements, little, if any, traffic interruption should result.

One road recently replaced two 246-ft. through truss spans with 89-ft. 6-in. deck plate girder spans on new concrete piers on a moderately heavy traffic line. After thorough study, the steel was erected by first placing the girders alongside the track between the trusses. The floor system was then removed, the girders lowered into place and the deck applied. This procedure was followed until all the girders were in place. The dismantling of the trusses was then begun, brackets having been applied to the girders to support the chords of the trusses. All of this work was carried out on a very definite schedule and, through the co-operation of the operating department, without a single interruption to traffic.

Conclusions

It is evident that much has been accomplished in the revision of working practices to eliminate interference with traffic through careful study of the conditions to be overcome, the design of the structures, providing workmen with improved equipment and tools, furnishing better and more durable materials, and the proper and efficient handling of the field work. In spite of our accomplishments to date, we can look to the future and anticipate still more exacting requirements, for it is a foregone conclusion that further increases in speeds will be in order when the war is ended and our country takes up again where it left off on December 7, 1941.

Committee—L. R. Lamport, (Chairman), Chicago; G. W. Benson, (Vice-Chairman), supervisor bridges and buildings, C. of Ga., Macon, Ga.; R. W. Cassidy, assistant cost engineer, C. & O., Richmond, Va.; A. B. Hillman, engineer maintenance of way, C. & W. I.-Belt., Chicago; Howard C. Madson, designer, C. & N. W., Chicago; assistant to chief engineer, C. & N. W., C. A. J. Richards, master carpenter, Penna., Grand Rapids, Mich.; A. C. Jones, bridge and building supervisor, Sou., Parrish, Ala.; M. H. Dick, Eastern editor, *Railway Engineering and Maintenance*, New York; R. C. Baker, bridge and building supervisor, C. & E. I., Danville, Ill.; R. E. Caudle, assistant engineer of structures, M. P., Houston, Texas.

Discussion

An investigation of soil conditions to determine whether, when a culvert pipe is being jacked through an embankment, the operation should be

continuous until completed, or whether the work can be stopped overnight, was suggested by C. M. Burpee *(Railway Age)*. In support of this suggestion, he said that several cases had come to his attention in which the pipe became "frozen" overnight and could not be moved when work was resumed the following morning, although it had been kept moving without difficulty up to quitting time. "In these cases," he said, "the only recourse was to start at the opposite end of the culvert and install the remaining pipe from that end."

Carrying Over Bridges and Trestles

Report of Committee

RAILWAY bridges and trestles are carried over primarily for two principal reasons: (1) lack of money, and (2) lack of materials and labor. While we may not be confronted now with a lack of money, we do face shortages of both labor and materials and must exercise the greatest ingenuity in utilizing the materials and labor that are available in order to keep our railways in proper condition for operation.

The decision as to the methods to be used in carrying over any particular structure must take into account safety, a reasonably long life, and minimum cost. This will avoid the use of construction details that are poorly adapted to the needs and obviate the necessity of frequent inspections and frequent return of the bridge crew.

Bridges may be classified into three general types: (1) permanent bridges, (2) culverts, and (3) trestles.

H. T. Livingston
Chairman

Permanent Bridges

The selection of the method to be used in carrying over permanent bridges and trestles to avoid their immediate reconstruction depends upon the conditions that exist within the structure. The proper procedure may include any of the following: (a) placing the superstructure on falsework or supporting bents, (b) strengthening the superstructures in place by adding reinforcing steel, (c) replacing the superstructure with second-hand spans, strengthened, if necessary, (d) placing helper bents to take the load from the substructure, and (e) repairing or reinforcing the substructure to increase its service life, where warranted.

(a) Deck plate girder spans may be strengthened by driving pile piers or erecting frame bent piers on proper bearings at their centers, or adjacent to abutments and piers. The location of the temporary piers will depend upon the character of the stream and the amount of drift it carries. When through plate girder spans or through riveted truss spans are placed on falsework, it is usually necessary to drive the bents on the regular pile trestle spacing, permitting the blocking under the steel stringers or floor beams to be placed upon the falsework stringers where most convenient. Where it is inadvisable to place such a large number of bents in the stream, wider bent spacing may be used and I-beams substituted for the wood stringers. If the panels of the truss are very long, say 20 to 30 ft., and the steel stringers rate above the proposed loading, bents may be driven each side of the floor beams and blocked to take the load.

Strengthening Existing Spans

(b) Steel spans may be carried over by strengthening in place. This may be done in many ways, depending upon the type of span. Careful study is involved in determining the best method of strengthening, and some ingenuity must be exercised in its selection. Many spans may be found to be too old or with details too poor to warrant strengthening. The material may be iron or Bessemer steel with a low yield point, and may require the addition of so much metal and the strengthening of such a large number of members as to make the cost prohibitive, particularly if the allowable increase in future loading is small. However, the strengthening of steel spans in place presents such attractive opportunities for economical carryovers that extensive investigation should be made before a decision is reached to replace them with new spans.

Deck plate girder spans may possibly be strengthened by splicing the web plates for bending if they were not so designed originally. This will add a few more square inches of flange section and, in some cases, materially increase the capacity of the spans. If the girders cannot be strengthened sufficiently in this manner, the practice is to add cover plates.

Flanges of stringers, floor beams, and girders of through plate girder spans and stringers and floor beams of truss spans may be strengthened in the same manner. Attention must be given to the connections and, where the number of rivets is insufficient, the old rivets should be removed and the holes reamed for larger rivets.

The strengthening of truss spans is much more complicated on account of the large number of members which may require strengthening. Side plates may be riveted to the webs of chords and web members of riveted trusses. The strengthening of pin truss spans presents considerable difficulty, particularly in those cases where eye-bars must be replaced with heavier ones, or with others of the same size but with metal of higher yield point. Here the entire span must be placed on falsework and the new pins and eye-bars inserted.

Old pin spans often develop loose eye-bars due to pin wear. In such cases, the eye-bar may be cut, shortened, and spliced or may be heated, upset, and thus shortened sufficiently to take up the slack. New and heavier counters may be applied by means of loop rods passing around the pins and connected to the center portions of the new rods, fitted with yokes.

Through truss spans may be strengthened by building in an auxiliary chord between the old trusses and fastened to the bottom flanges of the

floor beams near their ends. Heavier bottom laterals are provided and connected to the auxiliary chord at either side of the floor beams, in the usual manner, with gusset plates. This auxiliary chord is designed to relieve the old chord from stresses produced by wind and sway, but each chord will, of course, be stressed by both horizontal and vertical forces, the distribution of which is more or less indeterminate.

A member of this committee advises of a rather unusual project that his railroad has under way in which a bridge consisting of five 135-ft. triple intersection truss spans is being strengthened by constructing a pier under the center of each span. This involves the placing of new end posts, portal bracing and pedestals, the strentghening of old web members affected by the shear changes and the reinforcing of stringers and floor beams by welding on additional metal. When this work is completed, this bridge, which is now rated E-30, will accommodate E-60 power. This railroad has also strengthened deck and through plate girder spans by constructing piers at their centers, and incidentally relieving the old substructure of heavy reactions.

Use of Second-Hand Spans

(c) Many railroads have accumulated both light and heavy second-hand spans which have been removed from service for various reasons. These constitute an extremely important source of supply, from which may be drawn a large proportion of the requirements for re-use, and thus obviate the purchase of new steel. These spans are constantly being utilized by either strengthening or alteration, or are released for scrap. Even when cut up for scrap, parts are utilized in innumerable ways wherever possible.

A case in point is furnished by a western railroad. A long deck plate girder span was cut in two at its center to make two shorter spans of much higher rating, and a girder span 6 ft. deep was shortened and cut to a depth of 4 ft. This was accomplished by making a longitudinal cut in the web, removing the flange from the discarded portion of the web and forcing this flange on the shallower web, which had been drilled previously to match the holes in the flange.

Old deck plate girder spans have been made over into through spans by providing new floors and old through spans have been made into deck spans, the old floors being discarded for scrap.

Old truss spans with narrow clearances have been widened to standard clearance by remodeling the old floors or by furnishing new ones. The committee has a record of one 150-ft. truss span whose clearance was widened under traffic. In this instance, the old floor beams were lengthened and strengthened, the trusses were strengthened and new portals and top and bottom laterals were provided.

While the utilization of old steel spans, whether in stock or under track, may not be considered technically as coming within the category of a carry-over, the result is the same in effect, in that the expenditure of larger sums is deferred, and, of eualq importance at this time, the purchase of new steel is avoided, assuming priorities can be obtained.

Helper Bents

(d) With deck and through plate girder spans, pile or frame piers can be placed in front of the abutments or close to the piers and the girders blocked on them, thus relieving the masonry of a part or all of the reaction of the span. It is often necessary to drive bents behind abutments and place one or more panels of deck, the timber stringers spanning the bridge seat and being blocked on the falsework pier. The stringers must, of course, be placed low enough to clear the end floor beam, if any.

Where truss spans must be wholly supported at abutments or piers, a sufficient number of piles must be grouped directly beneath the trusses and behind the abutments in line with the trusses and I-beams, placed from the front to the rear in groups beneath the shoes of the span. The shoes are then blocked up on the I-beams. This arrangement necessitates removing parts of the backwalls, and possibly some parts of the bridge seats, to permit insertion of the I-beams. When the old substructure is replaced, the new concrete may be built to bridge seat elevation, except for the space occupied by the beam sets. When the falsework I-beams are removed, the grillages are slipped into the recesses, concreted in, and the spans lowered. No live load should be permitted on the span while it is supported on the blocking.

This method has been used many times, but in every case the substructure has been rebuilt immediately after the falsework was placed. However, there is no reason why the reconstruction may not be deferred for a reasonable period, provided the falsework is built substantially.

The U-wings of old stone abutments may show evidences of incipient failure, indicated by cracks at the junctures between the shafts and wings. To guard against possible collapse, it may be necessary to drive one or more panels of trestle behind the abutment or tie the wings together.

Substructure Work

(e) It often becomes necessary or advisable to make substructures safe against further deterioration. Very commonly, stone masonry must be pointed to prevent moisture from penetrating the interior, where, through frequent freezing and thawing, considerable damage may be done. Cracked face stone may be removed and replaced with concrete. However, where the deterioration has progressed to a point where pointing or minor repairs are no longer adequate, other methods must be employed.

Old stone masonry in pedestals, piers, and abutments may be grouted by drilling holes at itervals and pumping grout in under pressure. This will force out any water which may have permeated the interior. This method has been used by two eastern railroads, one of which has two very long bridges, one 900 ft. and the other 1,200 ft. long, in which the substructure is of stone and is failing under the shoes. However, the pressure grouting method is being used effectively in these cases to preserve the substructures until it becomes necessary to rebuild those portions whose life may not be thus prolonged indefinitely.

Many old stone abutments were built with U-wings, some of them very massive. When incipient failure is noted, the driving of falsework behind the abutment may be avoided if reinforced buttresses are built against the outer surfaces of the wings opposite each other, in pairs, and tied together with reinforced concrete members connecting their tops. These ties should be located several feet below sub-grade, and should be designed as beams to resist bending moment caused by the distributed live load and also to resist the lateral forces which are communicated to it by the wings. The wings of several abutments treated in this manner have been preserved for twenty years without showing any signs of further failure.

Culverts

Prior to 1900, many stone arches and stone boxes were constructed, particularly on new lines. Some were paved but many were not. In some cases an occasional stone strut was built between the side walls to neutralize the horizontal pressure at the footing. Some boxes were built with stone tops laid on the sidewalls and others with steel rails embedded in Utica cement. The wings usually were straight for boxes, but flared wings

were common on arches. The foundations, as a rule, were without piling, resting upon whatever soil happened to lie immediately below the stream. shallow depths and inadequate in area In many cases the footings were at for modern heavy power. Many of these arches and boxes are still in fair condition after a half century of service, but, owing to some of the defective characteristics of the material used in their construction, difficulties are encountered in maintaining them.

Methods of Repair

Many of these structures have been undermined more or less because of the absence of the paving or of inadequate paving. Where there is indication of scour, a plain or reinforced concrete paving should be laid the full length of the box or arch and an apron wall of proper depth built between the ends of the wing. Even fairly large rip rap laid throughout the box or arch may prevent a bad washout.

When stones show signs of weathering at the joints, they should be thoroughly pointed to prevent moisture from penetrating through the walls. Occasionally cover stones will crack under load or through temperature changes. If the filling above the box is shallow, it may be removed and the stones replaced by a reinforced concrete cover or a sufficient number of second-hand rails may be placed and embedded in concrete.

If the fill is deep, rails may be placed below the stone cover, with their ends inserted into the sidewalls. This involves considerable labor to break out the stones to a sufficient depth to permit placing the rails.

A more permanent solution, providing the area of the present opening is somewhat larger than the requirement for the drainage area, is to line the structure with reinforced concrete on top, sides and floor. This involves some difficulty in placing the concrete but it may be accomplished by placing the forms for a short distance at a time and ramming the rather dry mixture in from the open end of the form. In some instances where the box is small, the reinforcing bars may be omitted, thus enabling the concrete to be placed much more easily.

Lining Arches

Large stone arches have been lined very successfully by placing a shell 12 in. to 18 in. thick, heavily reinforced. If the arch is in good condition other than showing some signs of developing weakness here and there, the weak places should be protected against further deterioration by pointing or grouting.

Another widely-used method consists of lining the arch with steel plates resting either upon the old footing toes or on new bench walls, sometimes built as high as the spring lines. These new bench walls should have foundations properly designed to support the reactions from the liner plates in case the old arch ring should fail.

A more recent method of restoring old masonry and deteriorated concrete has been developed for use particularly in walls, arches, and tunnels. The deteriorated surfaces of the exposed stone or concrete are removed and the stone joints cleaned out. Forms are then built, leaving several inches between the face of the masonry and the back of the form. This space is filled with small gravel, pipes are inserted through the forms and cement grout is forced in through the pipes under considerable pressure. The grout is treated with chemicals to eliminate shrinkage. This method is applicable in problems of major restoration where the structure has failed from leakage, poor concrete, unstable filling, or locomotives' fumes in tunnels. It is reported that a very long tunnel on a western railroad was restored in this manner.

Pile Trestles

The maintenance of pile trestles comprises a problem of equal, if not greater, importance than that of permanent bridges. Some railroads have many more trestles than permanent bridges, and their aggregate length is much greater.

The vulnerable part of a pile trestle is the piling. However, as one committee member states, trestles may usually be carried over indefinitely if there are good piling below the ground level. His office, a few years ago, made a very exhaustive study of various methods used in repairing pile bents, specifying the particular lines and the particular territory where each of nine methods should be used. Four of these plans involve the insertion of various types of blocking beneath the caps, whereby a single pile may be blocked or a pair blocked. In all cases the blocks are toe-nailed.

The remaining plans contemplate stubbing at or below the ground line and splicing above the ground. Some of these methods are not recommended on certain lines, while others have been superseded by the practice of replacing the entire bent with a framed bent resting upon a sill set a sufficient distance below the ground line to insure that the supporting cut-off piling of the old bent is sound. This same method is used by another road on branch lines, by which means it almost entirely eliminates the driving of pile bents. Where the pile bents are quite high and have only four piles, or where the trestle is on a curve, additional posts are inserted beneath the chords and new batter piles are driven to reinforce the old piles and stabilize the bent.

An Eastern railroad, when replacing pile bents that have reached the renewal stage, excavates around the piling to below the water line and removes all of the decayed outer timber. Two ¾-in. dowels are then driven through the pile and a concrete footing poured entirely around the bent, the neat portion being carried up between the piles to the desired elevation. The neat work is boxed around the old piling and when the concrete has set, the old piles are cut off at the top of the footing course. A frame bent, previously framed, is then erected on the neat work and the boxed out recesses filled with concrete, thus sealing the tops of the old stubs.

Another Eastern railroad, in renewing deteriorated bents, places a falsework sill, blocked up from the ground level, on each side of the old bent and parallel thereto. Cross blocks are then placed perpendicular to the plane of the bent and between the piles, their ends resting upon the two falsework sills, after which the old piles are cut off above the ground at the proper elevation and another sill slipped under them. Excavation is made for the new concrete pedestals, and the pile stubs are cut off below ground water level.

The concrete pedestal is then poured to the pre-determined elevation below the sill supporting the old bent, and after it sets, a pre-framed bent is erected, following the removal of the old bent.

A large amount of material is needed to enable a road to carry over bridges, as the necessity now develops. Large savings in time and money may be made by utilizing good second-hand material. Every individual concerned with the handling of recovered bridge material should make a conscientious effort to conserve it with a thought of future use by his own department or by others. Squared-edge, second-hand timber or second-hand treated pile ends may be used in building or repairing frame bents, good treated or untreated stringers may be used to replace decayed stringers or inserted in light chords to strengthen them. Worn but good ties may be turned, stringers, ties and caps that are too short for re-use as such, may be cut for blocking or treated for use in constructing wood box culverts. Similarly the engineer of buildings, the water service department and others contemplating carrying over structures other than bridges, wherein the

quick procurement of steel angles and plates is important, may find large stocks of usable materials of this character in the second-hand steel bridge stock. All recovered material, whether of timber or steel, should be inspected carefully by competent individuals, and lists of usable materials furnished all who may be able to utilize them and avoid ordering new.

It is manifestly impossible to cover all of the innumerable phases of this subject of carrying over railway structures in a report of this length. The important thing is to give each problem mature and exhaustive consideration before making the final decision as to what shall be done.

H. T. Livingston (chairman), engineer bridges, C.R.I. & P., Chicago; S. T. Corey (vice-chairman), office engineer, bridge department, C.R.I. & P., Chicago; John S. Hancock, bridge engineer, D.T. & I., Dearborn, Mich.; A. E. Bechtelheimer, engineer of bridges, C. & N.W., Chicago; ings, M.P., Poplar Bluff, Mo.; W. W. Caines, assistant supervisor bridges and buildings, C. & O., Clifton Forge, Va.; F. W. Hillman, assistant engineer maintenance, C. & N.W., Chicago; A. P. Schmidt, engineer maintenance of way, T. C., Nashville, Tenn.; Leo D. Garis, assistant general bridge inspector, C. & N.W., Chicago; H. D. Curie, master carpenter, B. & O., Garrett, Ind.; H. W. Jenkins, supervisor bridges and buildings, N.Y.N.H. & H., Boston, Mass.; and J. L. Varker, bridges and buildings supervisor, D. & H., Carbondale, Pa.

Discussion

According to J. S. Hancock (D.T. &I.), one of the most difficult problems he is encountering at present is with creosoted pile trestles in which decay is developing in the interior at the top of the treated piles. He said that he had found it necessary in numerous cases to remove caps from bents containing defective piles before it was possible to determine what action should be taken. In some cases, he said, he had found it practical to shorten a single pile and place a corbel on it to support the cap; in others where several piles were involved but where the decay had not yet penetrated deeply, double-capping has served; and in still others, frame bents have been found necessary because of the depth to which the decay had penetrated. In connection with the latter cases, he inquired as to the best way to fasten the frame bents to the piles where the bridges cross streams that carry much drift.

J. L. Varker (D.&H.), reported that his road has been pointing and grouting stone masonry piers to save them from further deterioration. In grouting, the masonry is drilled to a depth sufficient to reach the weakened parts, after all surface voids in the mortar have been filled and allowed to harden. The grout is then introduced under pressure and the grouting is continued to refusal. He cited one bridge in particular that was in such condition by reason of the deterioration of the mortar between the stones, that the whole masonry substructure was to be replaced, but that it was finally decided to try grouting, and that this had been successful and all of the masonry was saved.

Through the use of strain gages, according to F. G. Campbell (E.J.&E.), one road which he cited, has been investigating the conditions of some of its older steel bridges, and has made some surprising discoveries with respect to stresses in members. In numerous cases, it was found that members which it was believed were being overstressed, were not; while others that it was believed were being stressed lightly, were being stressed heavily. "The use of these strain gages," said Mr. Campbell, "has enabled this road to carry over many bridges."

B. and B. Supply Men's Association

FOR the second consecutive year, under wartime conditions, the Bridge and Building Supply Men's Association found it impractical to attempt to present an exhibit of the products of its member companies in conjunction with the annual meeting of the American Railway Bridge and Building Association. In fact, in view of the shortened and intensive program of the meeting of the Bridge and Building Association this year, it was questioned seriously whether the exhibit was in order and could be of its usual value.

Of still greater importance, it was considered doubtful whether the manufacturers, because of the large demands being made on them for materials needed in the war effort, as well as by essential industries, including the railroads, could have presented an exhibit on a scale comparable with those of previous years. Furthermore, there was the added consideration of co-operating with the railroads in reducing the demands for transportation at a time when their facilities are so taxed with essential civilian and military traffic.

To maintain their contacts with members of the Bridge and Building Association in the absence of an exhibit, and at the same time show their interest in the many pressing problems of bridge and building men, 45 representatives of member companies of the Supply Men's Association registered their attendance at the two-day conference of the Bridge and Building Association and sat in on the various sessions. In addition, the executive committee of the Supply Men's Association met on October 21, with its principal order of business the election of officers for the ensuing year. In that election, all of the officers and directors were re-elected, except that A. C. Thomas, Overhead Door Company of Illinois, Chicago, was elected a director in place of E. E. Thulin, Joyce-Cridland Company.

The present officers of the association are: President, R. Y. Barham, Armco Railroad Sales Co., Inc., Chicago; vice-president, F. A. McGonigle, Mall Tool Co., Chicago; secretary, P. R. Austin, Johns-Manville Sales Corporation, Chicago; treasurer, W. Lyle McDaniel, Massey Concrete Products Company, Chicago; and the following directors—P. R. Austin (also secretary); F. A. McGonigle (also vice-president); E. C. Bleam, Joseph Dixon Crucible Company, Chicago; A. C. Thomas, Overhead Door Company of Illinois, Chicago; G. B. Coffey, A. M. Byers Company, Chicago; E. C. Gunther, Duff-Norton Manufacturing Company, Chicago; and C. C. Rausch, (honorary director) Dearborn Chemical Company, Chicago.

A Message from the President and Secretary

For thirty-five years, with few exceptions, it has been the privilege of the Bridge and Building Supply Men's Association to join with the American Railway Bridge and Building Association in their annual meetings by presenting exhibits of the products of their member companies. We regret most sincerely that present conditions, with the added burdens that have been placed upon many of our members in filling war and essential civilian demands, made it inadvisable to hold such an exhibit this year.

Year after year our members have looked forward to these exhibits as an opportunity not only to make new acquaintances and to renew old acquaintances among bridge and build-

ing men, but also to render a real service to them in bringing to their attention, at their greatest convenience, materials and equipment which have been designed specifically to help them in their work. With this latter purpose in mind, our exhibits have grown in scope and importance from year to year, and literature and samples, which for the most part made up the exhibits of earlier years, have given way to full-scale products and units of work equipment. If it were not for the war conditions that now prevail, it is fair to assume that we would have presented our exhibit this year as in the past years.

While we have now missed exhibiting for two consecutive years in conjunction with their meetings, we do not want members of the Bridge and Building Association to feel that we are unaware of their many problems and are inappreciative of our responsibility to help them in every way possible. In the first place, and while our hands are tied in many respects by the demands of the military, lend-lease, and priorities, we are making every effort to supply the railways with the materials and equipment they need to maintain their bridge, building and water service facilities adequate to the heavy demands that are being made on them. Furthermore, our members are ready at all times to assist the railroads in obtaining the most effective and economical use of their products, to keep them posted on their ability to meet demands, and to suggest substitute materials and methods to overcome shortages that prevail or develop in their material or equipment needs. In fact, to bring this information to the attention of the railways promptly, an increasing number of our member companies are employing the advertising pages of railway publications more consistently than ever before, supplementing the efforts on the part of their representatives who, in the light of difficulties of train travel, are finding it increasingly difficult to concontact personally many railway men out on the line.

What the prospects are for resuming our annual exhibits next year, no one can foresee now. The war situation at that time will be the guiding factor. In the meantime, our officers and directors will keep our organization intact, holding meetings from time to time to consider any problems that may arise—and always looking forward to the day when, with the war brought to a victorious conclusion, the normal joint activities of the Bridge and Building Association and our Association can be resumed.

R. Y. Barham, *President*
P. R. Austin, *Secretary*

Timber Foundation for Heavy-Duty Crossing

(Continued from page 854)

cell process to a net retention of 10 lb. of creosote per cubic foot of wood. It might be described essentially as a grid-work embodying a continuous support under each rail, consisting of two 8-in. by 10-in. members placed side by side and bolted together with ¾-in. bolts fitted with 4-in. No. 2 Teco timber connectors.

To facilitate installation, that portion of the foundation under each "diamond" of the intersection was designed as an independent unit. Since the B. & O. tracks carry the heaviest traffic, the foundation members under the rails in these tracks are continuous pieces with staggered joints, while those under the Reading rails are shorter sections mitered to fit against the longer members and fastened to them with ¾-in. bolts. The members extend 3 ft. 8 in. beyond the ends of the wing rails.

The foundation was framed and treated at Green Spring, Md., where the B. & O. has a wood-working mill and a timber-treating plant, the latter being operated by the Koppers Company, Wood Preserving division. The individual pieces comprising each foundation member were first preframed and bored and then bolted together, after which each member was planed on both the top and bottom to assure even surfaces. The foundation was then assembled to determine accuracy of fit.

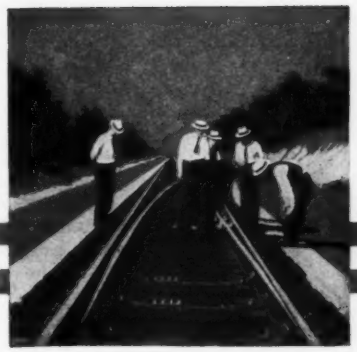
When the company was ready to install the crossing, the foundation, in its disassembled form, was shipped to the site and again assembled in its entirety at one side of the old crossing. Also, the new crossing frogs were assembled in place on the foundation in its temporary position. As another preparatory step, ballast was removed to the bottom of the ties.

In the work of installation, the procedure, starting with the westbound track, was to insert the foundation and frogs in one of the B. & O. tracks at a time while routing traffic over the other track. In each case, when the old frogs and ties had been removed, the subgrade was levelled off at the elevation of the old tie beds and was further prepared by spreading over it a thin layer of a dry sand-cement mix. The new crossing "diamonds" and sections of foundation were then lifted and placed in position by a locomotive crane.

Aside from the rubber pads in the crossing itself, another measure that was taken to reduce noise and vibration was the replacing of the tie plates in the B. & O. tracks for a short distance each way with special tie plates embodying rubber pads and inserts. For various reasons, including the fact that the new crossing incorporates a higher rail section than the old one (131-lb. as against 130-lb.), the top of rail at the crossing was raised about two inches, necessitating adjustment of approach grades.

The New Crossing with Its Timber Foundation

The crossing foundation described in this article was designed, constructed and installed under the general supervision of P. Petri, chief engineer maintenance of the system, and C. B. Harveson, engineer maintenance of way of the Eastern region. J. T. Andrews, assistant engineer, was in direct charge of the framing work, while the work of installation was supervised by W. Morrow, division engineer, and J. F. Dobson, assistant division engineer. The latter work was performed by company forces under the direct supervision of C. W. Sole, supervisor of road.



What's the ANSWER?

Programming Maintenance

To what extent can maintenance be programmed under present conditions affecting labor and materials? What advantages? Disadvantages? Why?

Do Not Affect Programming

By G. L. Sitton
Chief Engineer Maintenance of Way and Structures, Eastern Lines, Southern, Charlotte, N. C.

Programming itself is not affected by the present conditions affecting labor and materials. The difficulty is to get the necessary labor and materials to carry out the work after it has been programmed. The greatest obstacle in the way of programming maintenance work is lack of knowledge of what future traffic density will be. This is now the third year in which traffic has increased over the previous year and at rates higher than could be foreseen.

This means that maintenance programs that were prepared during the fall, and which were designed to cover requirements for the following year, have been insufficient to meet requirements because of the unprecedented increase in business. At this time it does not appear that this factor will apply to the 1944 program. I have not seen any forecast for 1944 made by those who are expert in this matter, but on our own road we are running on about an even keel and have been for some months, and I expect that if the war continues, our business in 1944 will be about the same as in 1943.

I believe, therefore, that we are in position to make programs for the different phases of maintenance for 1944, which should conform closely with the requirements, based on the business handled. I believe that these programs should be prepared and that every effort should be made to overcome obstacles in connection with the labor and material situation, and carry out the programs as planned.

I see no disadvantage in programming work to fit the business, even though it is known at the time the program is prepared that there will be many obstacles in the way and though some of them appear to be insurmountable. I believe that well-prepared programs should be used as goals to try to attain, and that every one who is concerned with carrying them out should do everything within his power to overcome the obstacles and to reach the goals. Surely a man who has a definite goal in view has a distinct advantage over one who takes the position that, since labor and materials are so hard to get, there is no use to plan ahead.

Who knows but that sometime, perhaps in the near future, those in charge of government agencies that affect or control labor and materials will realize that railway transportation is as necessary in a military way as men, armament, ammunition and food, if we are to win this war. When those in authority realize this fact, they will surely do something about it. It is as much their responsibility to prevent a breakdown of railway transportation as it is the responsibility of maintenance, operating and mechanical officers on the railways. For these reasons, I am a firm believer in programming maintenance work, in line with the business handled, and in making every effort possible to carry out these programs.

For instance, is not a railway which

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discuseed.

To Be Answered in January

1. *Considering the present density and importance of traffic, to what extent should section foremen be required to inspect rail for defects on lines where detector cars are operated? For what defects? How should this be done?*
2. *What are the advantages and disadvantages of pre-cutting lumber for buildings at a central point? Does this conserve materials? Why? Is it feasible to pre-cut lumber for repairs? Why?*
3. *In view of the relaxed requirements in hiring men, to what extent, if any, is it advisable to give consideration to special rewards for good safety records, or discipline for violation of rules and lax supervision? Why? How should the one be awarded and the other administered?*
4. *With what power tools should a bridge gang engaged in maintaining timber trestles be equipped? For what operations on these structures is there an unfilled need for power tools?*
5. *In view of the density and importance of todays traffic, what special precautions against drifting snow are warranted at this time?*
6. *To what extent is it practical under normal conditions to salvage parts of pumps that are to be scrapped? Under present conditions? How can they be re-conditioned?*
7. *In what ways can tie-tamping equipment be used to advantage during the winter?*
8. *Does the present difficulty in procuring materials, increase or decrease the desirability of programming building maintenance? How should past procedure be modified?*

prepares a comprehensive program for its needs for maintenance of way work equipment for 1944, and then tries its best to get as much as possible of each class of the equipment that it needs, in a better position than a road that takes the position that there will be so little work equipment available that it might as well not prepare a program but wait to see what it will be possible to obtain? It is a fact that on our own road we have received this year only a small percentage of the work equipment that we need, but I believe that we would not have received half as much if we had had no goal at which to aim.

Demands Are Most Exacting

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

Demands on railway tracks and structures are more exacting today than they have ever been, so that the shortages of both labor and essential replacement materials that now confront us make the programming of repairs needed to insure the uninterrupted movement of traffic a "must" proposition. Programming has always been necessary to insure orderly, economical and satisfactory maintenance, but now when so little may mean so much, that little must be used where it will help the most. The only way this can be done is to plan ahead and then follow the plan to the best of one's ability.

The men on the ground should be most familiar with what must be done to avoid trouble, but the old adage that "the squeaky wheel gets the grease" is known to the maintenance forces as well as it is to politicians, and is acted upon in about the same degree by both. Good programming does much to put the labor and material available where they will do the most good.

If the things that should be done first are put first on the program, they will be done, provided there is insistence on following the program. To insure that this will be done, it is essential that those who are responsible, and this includes every one from top to bottom, recognize that first things are to come first and conduct themselves accordingly.

Always, the first thing is to provide uninterrupted service for the movement of traffic, and to keep cars and locomotives on the rails. These are prime necessities, and they may retard repair work to some extent at times, but if an organized repair program is set up with uninterrupted train movements as its objective, the first things will come first. There can be no disadvantage in a program, provided it is elastic enough to meet day by day needs.

Programs Are Necessary

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

For many years we have prepared programs for maintenance work, and have educated ourselves to follow them somewhat rigorously. Today, the programming of maintenance work is as necessary as it has ever been, but we are only fooling ourselves if we believe that we can follow them as rigorously as we have in the past. Labor is scarce and what we have is less effective than most of us have ever known before. Materials are equally scarce and deliveries of those we can get are uncertain and often delayed. Again, the amount of work to be done is far greater than can be done with the labor available and the materials we are being allotted. Notwithstanding all of these drawbacks, and they are very real, maintenance can be done in a much more orderly fashion under a schedule that we cannot always meet, than under a haphazard arrangement.

Conserving the Ice Supply

Considering the desirability of conserving ice, what measures in the way of ventilation or insulation of existing ice houses can be taken before the winter crop of ice is stored?

Must Take All Measures

By General Building Inspector

While the present orders with respect to icing cars and new routings for some of the perishable commodities we handle have affected the amount of ice we consume at some of our icing stations, as well as the manner in which we obtain our supply, they have not affected in any manner the desirability of conserving the ice that we must store to meet our requirements. Whereas we formerly relied almost entirely on the storage of natural ice, we are now able to obtain manufactured ice at many points to which we formerly shipped ice for station use, for offices and for section and other gangs. We are also using manufactured ice at a number of our icing stations.

This has made a material reduction in the amount of natural ice storage and in the structures that we must provide. All of our natural-ice houses are of the usual type, with sawdust as the principal insulating material. To insure maximum protection for the ice, the sawdust should be maintained to the full height of the walls. If it has settled, additional sawdust should be placed as soon as the ice in the house is exhausted or the weather becomes sufficiently cool to warrant starting repairs.

Most of our ice houses formerly had no insulation under the roof, except, in some cases, ordinary ceiling on the underside of the rafters, and this was not very effective, and no provision for ventilation. In such a situation, insulating board should be applied, but it will be better to do this after the house is filled for this will reduce the amount of staging necessary. Likewise, I consider a small amount of ventilation desirable, in the form of small-diameter stacks at or near the peak of the roof.

Where we buy or manufacture ice, we provide storage buildings that are insulated the same as cold-storage warehouses and, since there is a continuous supply of ice, we are not called on to make repairs and changes at this season, as is necessary where natural ice is used.

Good Insulation Pays

By Supervisor of Buildings

Good insulation in an ice house will prevent waste of ice to an extent that will pay for the cost of protection in a relatively short time, depending on the amount of ice stored and the adequacy of the protection already afforded. It is almost idle to talk about a complete renovation of an ice house at this time, because of the shortage of labor and materials with which we are contending, but much can be done to protect the ice and conserve it.

We use natural ice, which we supplement with manufactured ice as the season advances, storing the extra supply in the same houses as we re-

ceive it, as we have no icing plants of our own. Our houses are insulated with sawdust placed in the side walls and with insulating board under the roof. It is important that the sawdust be kept to the top of the walls and this should be attended to at this time.

If the siding needs repairs, they should be made at this time, and other repairs required should also be made. If the roof is not adequately insulated, insulating board should be applied to the rafters, because an uninsulated roof is a source of large waste through melting of the ice. However, it is better to wait until the house is filled, as this will reduce the amount of staging that must be erected.

If the greater part of the siding needs renewal, I believe that it will be profitable to leave it in place, cover it with tar-saturated roofing felt, apply rigid insulation over this and then cover the whole surface with new siding, provided the studs are capable of carrying the additional load. If only one wall can be completed at this time, it will be helpful. The ordinary ice house is wasteful of ice and it would seem that any additional protection that can be provided will be well worth while.

Recruiting Operators

In view of the shortage of experienced operators, what special methods should now be employed to recruit and train new men to operate power machines? What details are most important? Who should be responsible?

Must Feel Responsibility

By G. S. Crites

Division Engineer, Baltimore & Ohio, Baltimore, Md.

To some extent, the new men that are now being recruited lack a basic sense of responsibility, largely because they do not have any background of railway operation and maintenance. However, machine operators must be responsible; otherwise their service cannot be satisfactory in any of its phases. On the other hand, women, either by instinct or necessity, asume responsibility almost automatically. Instead of depending entirely upon the recruiting of new men, the question of women operators might be considered.

Men deferred from military service are running trucks, pumps, air compressors, ballast-cleaning moles and excavating equipment, and are handling bulk materials with small cranes. Women who can run automobiles or trucks, or who can operate farm tractors, can soon be instructed in the use and care of the simpler roadway machines. They can replace such men machine operators as are lost and may replace men, who can then be trained to operate the larger machines such as piledrivers, large cranes and others upon which men operators are a necessity.

Although it may be unwise to do so in some sections, the possibility of employing colored operators is worthy of consideration. Some are able to assume responsibility and some are not, but any who can do so will be a distinct gain.

The supervisory officer who is responsible for the output of the power machine should have jurisdiction over the operator and should satisfy himself that he has been trained adequately. The equipment maintainer should instruct the new operator in the care, inspection, lubrication and operation of the machine to which he is assigned. He should endeavor to increase his efficiency and knowledge of the machine. Cleanliness and lubrication are prime necessities, but smooth and expert handling is also of prime importance, especially on load-lifting machines. Again, it is important that he know when not to run a crippled machine, for it may tear itself to pieces if it is forced to run when something is wrong.

A Difficult Problem

By C. R. Knowles

Superintendent Water Service (Retired) Illinois Central, Chicago

Always a difficult problem, the recruiting of operators for power machines has become increasingly difficult by reason of the present manpower shortage. It is now practically impossible to employ skilled operators for these machines, so that one must select men from the ranks of the men still in service and train them for the job. The operation of the smaller self-contained machines and tools, such as bolt tighteners, unit tie tampers, power drills and similar equipment does not present a very serious problem. They are less important than the larger multiple-tool machines, except where the unit tools are used in combination with other tools in a large operation, such as laying rail, general surfacing, etc., where several machines work together as a unit, and the failure of a single machine may interfere with or delay the progress of a large gang.

Operators of both small and large machines are usually selected from the ranks of the men employed in bridge and building, section and extra gangs. The smaller machines do not require extensive knowledge of machinery for their operation. The use of automobiles, tractors and similar equipment has become so widespread that it is seldom difficult to find men in the gangs who can readily familiarize themselves with the simple details of operation. However, they should be instructed thoroughly with respect to lubrication and avoidance of abuse of the tool. Lack of suitable oil and abuse are principal causes of failure.

Cranes, draglines, and similar machines should have regular operators asigned to them. In selecting these operators from a gang of men, those who have some mechanical knowledge and are careful in their work, should be given preference. The primary requirement for a good operator is an aptitude for machinery, but he should also be alert mentally. Slow thinkers and misfits should be avoided. If the prospective operator has no aptitude for mechanics, he will not take any interest in the machine or its operation, and will be a potential failure from the outset. It is of great importance to select a man who will prove to be competent, because existing craft agreements involving seniority rights may make it difficult to make changes or adjustments later on if it is found that the wrong man has been selected for the job.

Regardless of his ability, he should be trained in the details of the operation of the machine. It is desirable that he spend a few days at the plant where the machine is built, for he will obtain a better working knowledge of it at the factory than in any other way. Where this is not advisable, his training must be left to the maintainer and the manufacturer's service men, both of whom should be thoroughly conversant with the power machine.

Boys have been used succesfully in maintenance of way work, and it may be possible that some of them, especially those taking mechanical courses in manual-training schools, can be recruited as operators. If they are to be considered they should be placed

with experienced operators for training.

Supervisory and other officers having any responsibility for the operation of the machines, should have sufficient knowledge of them to know whether they are being operated properly. The responsibility for the selection of the operator from the ranks lies largely with the supervisor and foreman, as they are in better position to know the latent ability of the men serving under them.

Should Be Alert

By C. E. Miller

Assistant Engineer Maintenance, Chicago & North Western, Chicago

Operators of power machines of the types commonly used in maintenance should be active and alert young men who have more than average mechanical understanding, with a serious attitude toward safety and of such physical make-up that they can work effectively throughout a normal working day. Any lag in their efforts is reflected promptly in the output of their machines and in consequent delay to the gang with which they are working.

Such men naturally are of the type and within the age limits that have been inducted so extensively into the armed forces and war industries, so that their positions will of necessity have to be filled with the best of the personnel that remains available. This may include younger section laborers and men from bridge and building gangs who are above draft age or who have been deferred. We may be able to recruit some of the huskier school boys who have not yet reached draft age and who desire outdoor work during vacations.

While the sources from which other labor may become available are quite uncertain at present, they may include Mexicans and war prisoners, among whom there may be some individuals who can be trained as operators. However, extraordinary care will be necessary in selecting men from such groups, and they may require close supervision to insure that they handle the machines safely and effectively, and without damage to the equipment. Their interest, spirit and loyalty will be quite different from that of the young fellows who, during peace times, were working to establish themselves as parts of the permanent organization of the railway.

Well in advance of the working season, supervisors and foremen should get in touch with local boys in their neighborhoods in an endeavor to interest them in railway work and, wherever possible, line them up in advance for training if they show promise of developing into satisfactory machine operators.

More than ever before, foremen, supervisors and supervisors of work equipment, and their assistants, will need to be alert in selecting and training the men who are available to them, and to watch them carefully to insure that they work safely and effectively. Their performance probably will not be equal to that of their peace-time predecessors, but I believe that by close and constant supervision we will be able to carry out our work during this difficult period with reasonable satisfaction and effectiveness.

Tie-Inspection Practices

In view of the present shortage of ties, what changes, if any, should now be made in tie-inspection practices? Should an independent tie inspector accompany the foreman to insure against premature removal? Why?

Foreman Knows Best

By C. D. Turley

Engineer of Ties and Treatment, Illinois Central, Chicago

Owing to a general shortage of ties, maintenance officers are faced with the problem of keeping their tracks in safe condition for operation with a reduction in the number of crosstie renewals. Experience has taught that this can be done over a limited period by following certain general practices.

Obviously, more ties will be required where the track is surfaced out of face, for which reason out-of-face work should be avoided wherever it is economical or advisable to do so. When track is surfaced out of face, no ties should be removed which, in the judgment of the foreman, contain enough additional life to offset the labor cost of removing them at some later date.

Where out-of-face surfacing is not considered necesary, ties should be spotted in and the following general practices should be adhered to:

(1) No tie containing one year of additional life should be removed; (2) spot one good tie between two defective ones; (3) where ties hold surface, but not gage, spot in enough ties to make the track safe; (4) give joint ties preference; (5) keep the tie condition as nearly uniform as posible on all districts, taking into consideration the amount and kind of traffic, and the equipment operated.

The distribution of ties to the various districts should be followed closely, to insure that no oversupply accumulates at any point. The stock of ties on the line should be held as low as is considered necessary to protect the track structure.

I do not believe that it is either necessary or advisable to employ an independent inspector. The section foreman, who is more familiar with the peculiarities of his track than any outsider can be, should inspect the ties and make the original recommendation for renewals, tabulating this information by miles. The track supervisor, who is also familiar with the entire district, should discuss the matter with the foreman and check a part of his section with him. The division engineer, who is responsible for the tie conditions on the entire division, should explain to the supervisor the policy to be followed, and check a portion of his district with him to make sure that the instructions are being followed, and that a safe and uniform tie condition will prevail over the district. By this procedure, satisfactory results can be obtained.

Must Know Conditions

By W. H. Sparks

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

There is no doubt that over a period of years, many ties are removed from the track that could have been left in for another year or two, and they would have held surface or gage or both satisfactorily. Anyone who has made a tie inspection knows that it occurs frequently that ties that have been spotted for renewal are found to be in better condition when the ballast is cleared away from them than the surface inspection seemed to indicate. Likewise, ties that looked all right at the time of inspection are found to be ready for removal when the cribs are opened. However, the ratio of these ties to the whole number recommended for renewal is small and, in general, the good ties

that have been spotted, about balance those that have been missed.

If the main purpose in making tie renewals, and incidentally the inspection, is to maintain safe, smooth-riding, track with a uniform tie condition throughout, much timber will be saved in the long run, compared with a policy that demands that all ties be in prime condition. Every tie has a definite service life and it should be allowed to attain that life. The only exception is that when surfacing out of face, it is more economical to remove ties that have only two years life left than it is to go back over the track and make spot renewals at the end of two years.

Now as to the present situation, ties are scarce and must be used more sparingly than is altogether desirable. But if the track is well timbered, tie renewals can be reduced below the desirable level with safety for a year or two. I do not advocate this, except as a means of meeting the present emergency, but we must work with the resources we have. I do not favor an independent inspector for he never knows local conditions. The foreman does, however, and he, together with the supervisor, is just as capable of making the inspection and the recommendations as some outsider who knows little of traffic and nothing of local requirements.

Timber for Spot Renewals

Do present conditions make it specially desirable now to preframe and treat timber for spot renewals of bridge members? For sectional renewals? For buildings? What considerations are involved?

It Is Doubtful

By G. L. Staley
Bridge Engineer, Missouri-Kansas-Texas, St. Louis, Mo.

It is doubtful whether any conditions make it desirable to preframe and treat timber for spot renewals of bridge members, unless the member to be renewed was preframed and treated. Where this is done, it is merely adding long-life material to a structure, the greater part of whose service life is spent. The service life of the structure as a whole will not be increased, and no money will be saved by such action.

In the case of sectional renewals, the decision will depend entirely on the type of the structure and what percentage of it the renewal will include. If the proposed renewal comprises some part of the structure that will not be affected by renewal of the remaining parts later on, preframing and treatment will be as desirable and economical as with complete renewal. The same considerations will hold for buildings, although the details may be somewhat more complicated.

The only consideration involved is that of prolonging the life or continuing the existence of the structure. There may be several subsidiary considerations, however, such as the grades of material available, the status of the service life of the structure, the expense or the practicability of making the repairs, and others arising by reason of the geographical location, the economical or practical situation and the maintenance policy involved.

No Special Effect

By S. F. Grear
Asst. Engr. of Bridges, Illinois Central

I do not consider that present conditions have any special effect on the desirability of preframing timbers. It is always good practice to do as much framing as posible before treatment. On our road, bridge timbers are not prebored, but are preframed as follows: Six and 8-in. bridge ties are dressed to full size; larger ties are dressed in accordance with lumber standards; stringers are sized to 16 in. over bearings; caps are framed to uniform thickness by planing; guard timbers are preframed for timber trestles, but only in special cases for the decks of steel bridges. I do not consider it possible to do more framing than this for spot renewals on bridges.

Spotting new timbers in with old timbers is not good practice and is done only when a shortage of money or materials makes it necessary to do so. Old timbers are almost always mashed down to some extent at the bearings, for which reason additional field framing becomes necessary.

For sectional renewals, the same preframing is required as for new construction. Wherever possible, renewals should be made sectional or out of face. This permits all timbers throughout the section to be of one thickness. We have not yet been able to develop a practical method for measuring up old bridges and of getting the new timbers framed to an exact fit for repairs. In view of the present shortage of material, and especially of labor, and of the shortage of cars for company shipments, it is not possible to make small shipments of lumber, and I believe that for the present, there is nothing to do except to ship standard stock for all repairs.

What to Do About Putty

What effects do the present restrictions on the use of linseed oil have on the application of putty? What substitutes are available? The relative advantages and disadvantages?

Putty Is Not Restricted

By A. T. Hawk
Engineer Architect, Chicago, Rock Island & Pacific, Chicago

Manufacturers who make linseed oil are not restricted with respect to their output, so far as government limitations are concerned, and those who also make putty can use the oil without recourse to substitutes. On the other hand, jobbers and dealers who buy linseed oil from the manufacturer are obliged to dilute it one-third with a volatile thinner before it can be sold for civilian use. This requirement for the use of thinners does not apply to manufacturers, however.

In the manufacture of putty, no special restrictions have been made, other than that which applies to paints, namely, that the linseed-oil content shall not exceed 3¾ lb. per gal. This has no effect on the composition of the putty however, for 100 lb. of putty is equivalent to about 16 gal., while the oil content of this volume of a good grade of putty amounts to approximately 14½ lb.

Because of the relatively small amount of linseed oil in putty, there

seems to be no reason to expect restrictions on the amount of binder used, for experience has shown that putty made with linseed oil that has been diluted with inferior oils, or that has been made with substitute oils, does not give good results when glazing wood sash.

Some reliable manufacturers say that putty made with linseed oil containing 20 per cent of mineral driers can be used successfully if the putty is protected with paint. At present, while paint manufacturers are restricted in the use of linseed oil, the putty industry is still allowed to use 100 per cent of its linseed-oil requirements.

Substitutes in Making

By General Inspector of Buildings

At present there are no government restrictions on the manufacture or sale of putty, and none on the manufacture of linseed oil, although the supply of flax seed, most of which is imported, is considerably reduced from its prewar volume. Restrictions on the use of linseed oil in paint are somewhat severe, and there is always a possibility that they may be extended to putty.

Until recently, no fully satisfactory substitutes for putty for glazing wood sash have been developed, although substitutes of one kind or another have been tried from time to time. The most promising of these have been bituminous compounds, but none of them are suitable except for limited use, because of their color, and as none of them are the equal of putty, they have not gained acceptance. Recently, some experiments have been made with certain of the new plastics, but while they have given some promise, none of them, so far as I know, have been under test a sufficient time to warrant any conclusions as to their value. I am not aware, however, that any of these substances have become available in the market, and as long as putty remains available, I prefer to wait until more is known about their ultimate performance.

Operation of Valves

What precautions should be exercised to prevent damage when operating globe and gate valves?

Close Valve Completely

By J. H. Davidson
Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

The first precaution to be observed in preventing damage to valves and consequent high maintenance costs is to choose a valve that is suitable for the service that is to be required of it. The three types of valves in most extensive use are gate, globe and angle valves. Usually, gate valves are employed where it is desired to have straight-way flow with minimum pressure drop and where the valve can be operated either fully open or closed, or where it is not operated too frequently. Gate valves should not be used for throttling service, because such service subjects the discs to wire-drawing service.

Because the design of globe valves necessitates changes in the direction of flow, they cause pressure drops that are sometimes objectionable. On the other hand, they are suitable for throttling service and, in situations where they are operated frequently, they are preferable to gate valves because they are more easily repaired, by replacement of worn parts. Angle valves are practically the same as globe valves in seat and disc construction, and where a 90-deg. turn is required in a line, they can be used to replace an elbow and a globe valve.

After the most desirable type of valve, that is, gate, globe or angle, has been determined for an installation, the next precaution is to select the valves made of the most suitable metal and with the most desirable structural details. It is a good plan to consult the manufacturer on such technical details to insure getting a valve that is suitable for the service.

Having secured the valves most suitable for the requirements, the next precaution is to see that they are installed properly. The pipe should be cleaned by blowing or swabbing befor it is assembled or used. Dust and scale often damage valves. Remove burs from the pipe by reaming the ends after cutting and threading, since the burs will likely damage the valves. Use the correct size and type of wrench when applying the valves, and when making up the valve nipples, do not place the valves in a vise as there is danger of closing the vise too tight and thus of distorting the valve. Making the joint up too tight is also a cause of distortion.

Do not locate valves where they will be subject to damage by being struck by other objects, such as trucks and wheelbarrows which will bend the stems or otherwise distort the valves. After the valve has been selected and installed, a few simple precautions are required to insure long life and low maintenance cost.

When closing a valve, be sure that it is entirely closed, but do not force it sufficiently to damage the seat or discs. Also, when opening a valve, always open it entirely, unless the service calls for throttling. Do not use wrenches or levers on wheels to open or close valves. The wheels have been designed to provide the correct leverage for hand operation. Keep the valve stems well packed and replace worn parts of valves as they become worn enough to leak.

Valves often leak because they have become dirty and scaled. When this happens, the valve should be cleaned, for if the condition is allowed to continue, it will shorten the life of the valve. Valves that are used infrequently in regular operation, such as gate valves between storage tanks and water columns, should be opened and closed at regular intervals to keep the seats and discs free from incrustation, so that when they are actually required to operate they will open and close as they should.

Many Ways to Avoid Damage

By C. R. Knowles
Superintendent of Water Service (Retired) Illinois Central, Chicago

There are many ways by which damage can be avoided when operating globe and gate valves. The most common abuse of valves, particularly in the smaller sizes, is in closing them too tightly against the seat. This practice strains the stem, causes excessive wear on the threads and may distort the valve body or damage the seat. Most of the damage to faucets, as well as to valves, is caused by using more pressure than needed to close them.

Gate and globe valves, 2-in. and smaller, if in good condition, should be closed by using the thumb and four fingers only. If a valve of this size requires more force than this to close it, there is something wrong with the valve, and it should be taken down and examined. It will usually be found that the seat has been damaged. If it continues to leak, it may require cleaning or a new seat. Obviously, the larger valves require more force to close then, but it will always be found that the hand wheel or other handle, as designed and furnished by the

manufacturer, is sufficient in size to close the valve if it has not been damaged or the seat has not been fouled. Wrenches or bars should never be used to obtain additional leverage, as this will invariably result in damage.

Correct packing is important in the operation of a valve. If the stem packing is dry and hard, it will act in the same manner as a brake, making the valve hard to operate. If the valve has not been operated for some time, the stem may be "frozen" to the packing, making it difficult to operate without damage. Stems have been twisted off and threads stripped on valves with rising stems because of the condition of the packing.

Most of the damage to valve stems is caused by particles of scales or dirt lodging on the seat and becoming forced into the face of the seat when the valve is closed. If the valve does not close completely when reasonable force is applied, the seat should be examined for possible damage and the valve and pipe line should be cleaned, if necessary. If the seat is damaged, it should be ground in, or new seats should be applied.

Failure to close a valve completely may cause it to leak through and damage the seat. A fine opening will cause the seat to become wire drawn. In closing a valve, it should be closed firmly but without excessive force. The seats or gates of gate valves may chatter when partly open. This will invariably cause damage to the valve. It is sometimes found necessary to control the pressure or delivery of liquids by closing the valve partly, generally spoken of as throttling; but this should be avoided wherever possible.

Gate valves are sometimes hard to open and close by reason of high pressure in the line, this being especially true of the larger valves. This can be overcome by installing a by-pass with valves, around the large gate, which allows the pressure on both sides of the valve to equalize. A by-pass is seldom required for ordinary service, but only on the larger valves, say, 16 in. and larger, and for pressures in excess of 100 lb.

Most of the valves in general service open by turning to the right or clockwise, although many valves open in the opposite direction or counter clockwise. It is important that operators know whether the valve is right hand or left hand to avoid damage in attempting to turn the stem in the wrong direction. This is of particular importance where valves are in underground pipe lines. Some valves have the direction of operation stamped on the operating wheel. All valves should be provided with suitable operating wheels or handles and, if they have been removed for any reason, they should be replaced. Where handles or wheels are missing, wrenches and pliers are generally used to open the valve, with the result that the stem may be badly scarred, bent or even twisted off. This does not apply to valves that are designed to be operated with a key.

Underground valves often become inoperative because of infrequent use. As a rule, these valves are intended for emergency use and often fail to function when most needed. Such valves should be kept well lubricated and should be repacked as required. Valve pits and valve boxes should be covered tightly and the valves should be operated once or twice a year to insure that they will respond when needed. Most valves suffer from abuse and misuse rather than from overuse, but a little care and the exercise of good judgment will prevent damage, insure more satisfactory operation and prolong their life considerably.

Preparing Yards for Winter

In expectation that traffic will continue at its present level, what work should yard gangs now undertake in preparation for winter?

Necessary in All Cases

By Supervisor of Track

Most of the preparations for winter in yards must be done regardless of the fact that the volume of traffic is now greater than any of us have ever known, for they are just as necessary for normal as for abnormal traffic. The first and most important job is to see that all switches are well drained, because this will facilitate the removal of snow, particularly where snow melters are in use, and largely prevent the formation of ice. All of the area around water columns should also be drained, for this area may be dangerous for trainmen if ice accumulates.

Guard rails and frogs should be put in good condition, and all loose and broken bolts should be tightened or replaced. Guard-rail and frog blocks should be examined and loose or missing ones refitted or replaced. Tools should be inventoried and worn tools turned in for new or reconditioned ones. An ample supply of brooms and shovels should be ordered, and if snow-melting equipment is in use it should be inspected and all defective units repaired.

Fully as important as preparation for snow, all scrap should be removed, and any piles of coal, sand or other lading that has escaped from cars should be picked up. Work trains are hard to get and it is difficult to persuade yardmasters to give up tracks at present, but a thorough cleaning of all such obstructions will pay dividends to both the maintenance and yard-switching forces. I try to handle this with the yardmaster, but if he is not responsive, I do not hesitate to go to the superintendent.

Winter work in yards does not vary greatly from that of other seasons, except for surfacing, lining and renewing ties. It is well to have a reasonable stock of switches, frogs and guard rails on hand, for they are often hard to get under winter conditions, and traffic must not be delayed.

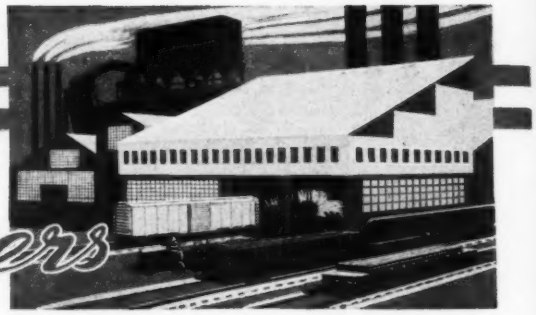
Do Winter Work in Summer

By District Engineer

Most of the preparation for winter should be made in the summer and fall —that is, the tracks should be reconditioned by renewing ties, by surfacing, by constant policing, by gaging, by straightening rail where tie plates have not been installed, by maintaining frogs, switches and guard rails to the required standard, so that none of these things will need to be done in a last-minute rush just before cold weather and winter storms arrive.

If the work is organized with this objective, ample time will be available to get snow-fighting equipment in shape without resort to emergency measures. This should include an ample supply of snow brooms, shovels, scoops and salt. If snow-melting equipment is used, it should have been inspected and defective units repaired immediately at the close of the previous winter, and then stored under conditions that insure against damage, so that no action need be taken at this time with respect to this equipment, except to check it to see that nothing is missing. I am decidedly in favor of preparedness well in advance of winter, both with respect to the equipment and the organization. Half of the battle is won if equipment is ready and every man understands the part he is to play when an emergency arises.

PRODUCTS of Manufacturers



Prefabricated Structures

BUSH Prefabricated Structures, Inc., New York, has developed two types of prefabricated housing suitable for bunk houses, mess halls, repair shops, tool sheds and utility buildings in railway construction and maintenance camps. Both types of housing are demountable and are made up of standard panels which can be quickly assembled to form one-story buildings 20 ft. in width of various lengths in increments of 8 ft.

A Bush Prefabricated Railway Bunk House and Dining Hall

The two types are denoted as Type A and Type B, of which Type A is more elaborate and is fully insulated, with paneled interior surfacing and built-in screened openings. The Type B units have unfinished interior walls but may be secured with ½ in. rigid insulation applied to the interior surface of exterior wall areas. Only six standard types of panels are required to form a one-story building 20-ft. wide, of any length, in multiples of 8 ft.

In assembly, a temporary foundation is first prepared, which may be of blocking, pile butts, etc., set level and laid out square. Three rows of foundation blocks capped by sills are needed, spaced about 10 ft. apart, one on each side of the building and the third in the middle. If the foundation structure is properly prepared, the floor panels may be assembled directly as they are unloaded. The floor panels are in two sizes, approximately 4 ft. by 10 ft. and 8 ft. by 10 ft. in area. The smaller panels are the starting and ending panels with the flooring set back on two edges for the side walls. These panels are placed on the foundation and bolted together.

The wall panels are of two types, side wall panels and end wall panels. These are bolted to the floor and fastened to adjoining wall panels with lag screws. The side wall panels are approximately 8 ft. by 8 ft. in size and by starting with half the standard width on the floor panels and the full width on the wall panels, the construction joints are staggered.

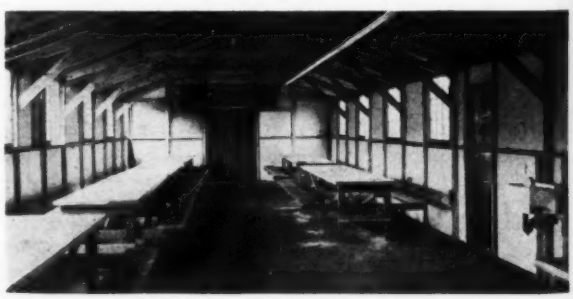
The roof panels are all of the same size. They are placed from temporary scaffolding and are bolted together at the ridge and secured at the wall by hook bolts. In addition, a 1-in. by 6-in. collar beam is bolted across, connecting the two roof panels at every roof panel connection and a 1-in. by 6-in. knee brace and a 1-in. by 8-in. gusset are bolted to the roof panels and the side-wall panels at every alternate roof panel connection.

The wall panels are designed so that part of the roof load is taken through the vertical siding. The roof panels are so constructed as to completely seal the eave, eliminating the necessity for field application of filler boards, faces, etc.

The other of the six types of standard panels is the gable panel, which is nailed in place at the ends of the building after the roof has been placed. After this is done the joint battens and corner boards are nailed in place. Any desirable roof covering may be used.

The windows and doors are provided as integral parts of the wall panels, eliminating the field operation of fitting, setting and securing them. The windows are all weather-stripped.

The various panels may be ordered in a variety of lumber. For example, the flooring may be 1-in. by 6-in. or 1-in. by 4-in., T & G fir, hemlock, spruce or Southern pine and the wall panels may be of similar lumber or clear all-heart California redwood. The roof panels can be furnished in one-inch T & G or S 4 S Southern pine, spruce, fir or hemlock, or ¼-in. Tempered Presdwood. With Tempered Presdwood panels, roof battens with an asphalt gasket are used to cover the joints. These panels eliminate the necessity of applying roll roofing and make the building completely demountable.



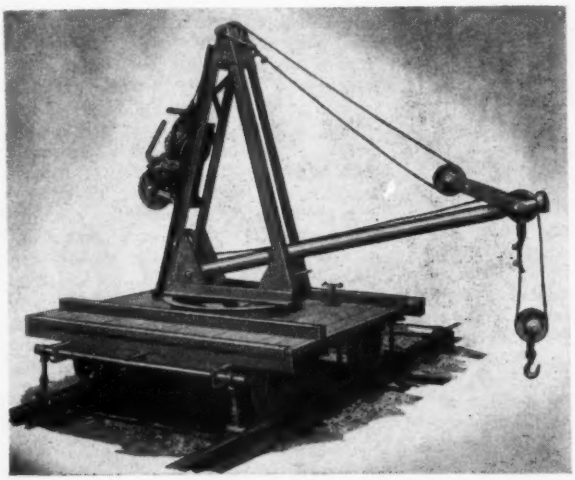
Interior View of a Dining Hall of Prefabricated Construction

It is said that the rigidity, simplicity

and accuracy of the panel construction assures rapid assembly of these structures with the least possible field labor and that the assembly work can be done by unskilled labor.

New Derrick Car

THE Kalamazoo Railway Supply Company, Kalamazoo, Mich., has developed the Kalamazoo "4" derrick car to speed maintenance of way construction and repair work and provide greater safety in handling heavy timbers and material. The derrick car consists essentially of a cable-operated steel derrick with seven-foot boom, mounted in the center of a trailer or push car equipped with four insulated rail clamps, one at each corner of the car, that can be attached to the ball of the rail. The derrick has an overall height of 8 ft. 4 in. above the rail and revolves on a circular steel base through an angle of 360 deg. The unit weighs 1,850 lbs. and has a load capacity of 3,000 lbs. It is operated by ⅜-in. steel cables and a two-speed winch with a ratchet and pawl lock, providing means for handling loads quickly and easily by one or two men. A band brake is provided for lowering the load.



The Kalamazoo "4" Derrick Car with Rail Clamps Attached to the Rails

The car on which the derrick is mounted has a steel frame and is 7 ft. 11 in. long by 5 ft. 7 in. wide. It has a wheel base of 53½ in. and two-inch axles with Timken double-row axle bearings. It has four-wheel, adjustable, self-centering cast iron brakes, operated by a foot pedal with a ratchet lock. Rail skids are provided for ease in handling on and off the track.

The derrick may also be mounted on a 38 B gasoline-drive bridge gang car instead of on a trailer car.

New Book

Bridge and Building Proceedings

PROCEEDINGS, American Railway Bridge and Building Association for 1942. 274 pages illustrated, 6 in. by 9 in. Bound in Cloth. Published by the Association, Elinor V. Heffern, secretary, 310 South Michigan avenue, Chicago Price $2

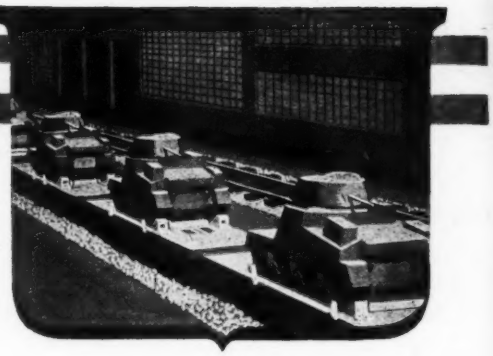
This volume contains the reports and addresses which were presented at the forty-ninth annual meeting, together with the discussions that followed their presentation, and the minutes of the business session. It reflects the conditions which the war was beginning to impose in shortages of labor and restrictions on materials, and the concern of bridge and building men with respect to the maintenance of the structures in their charge. This is shown not only in the range of subjects considered in the reports and addresses but also in the discussions, most of which are still pertinent to the greater restrictions under which they are now working.

The subjects covered by the reports include the prevention of personal injuries; the conservation of bridge, building and water-service materials; measures for meeting the demand for increased water supplies in fast-freight service; rail fastenings on bridges, turntables and cinder pits; the repair of steel bridges; piles and pile driving; the cleaning of masonry buildings; and wearing surfaces for building floors, platforms and roadways.

To a still greater extent, the papers and addresses presented in the volume reflect the impact of war conditions and the anxiety felt over the situation by the officers responsible for the maintenance of structures. These include the Outlook for Labor in Bridge, Building and Water Service, by Edwin M. Fitch, assistant director, Division of Transport Personnel, Office of Defense Transportation; Blackout and Protective Lighting, by W. G. Darley, General Electric Company; the Protection of Structures in Time of War, by B. R. Kulp, chief engineer, Chicago & North Western; The Material Situation,—As Seen by the WPB, by David P. Beach, assistant chief, Maintenance Equipment Section, Transportation Branch, WPB; As Seen by a Bridge Man, by J. B. Hunley, engineer of structures, New York Central System, West of Buffalo; As Seen by a Building Man, by O. G. Wilbur, appraisal engineer, Baltimore & Ohio; As Seen by a Water Service Man, by G. E. Martin, superintendent of water service, Illinois Central; Possibilities for Reclamation and Salvage, by R. P. Hart, bridge engineer, Missouri Pacific; The Problems Facing the Railroads, by Ralph Budd, president, Burlington System; and Reducing the Demand for Cars and Locomotives in Company Service, by W. D. Beck, district manager, Car Service Division Association of American Railroads.

Caterpillar and Le-Tourneau Equipment Constructing the Trans-Sahara Railway in North Africa

NEWS of the Month



Okie Awarded Second Army Decoration

The Soldiers' Medal for extraordinary heroism, not in action, has been awarded to Lt.-Col. Frederick W. Okie, commanding officer of the 727th Railway Operating Battalion, who is already the possessor of the Legion of Merit medal for personal valor.

According to a dispatch from the Military Railway Service, Transportation Corps, Allied Force Headquarters in North Africa, the new decoration was awarded as a result of Colonel Okie's action when a fire broke out in a captured railway freight depot full of enemy ammunition, incendiary grenades and other explosives.

"With utter disregard for his personal safety," the citation stated, "Colonel Okie supervised and assisted in coupling and removing cars of American ammunition, rations and bridge material, from which shells were exploding in all directions. His actions, even though in danger of death or injury from flying fragments, resulted in the saving of much badly needed supplies, and prevented serious damage to vital railroad facilities."

Colonel Okie is commanding officer of the 727th Railway Operating Battalion which has established a brilliant record for outstanding performance in the North African and Sicily campaigns. In civilian life he was division superintendent of the Southern at Birmingham, Ala.

Personnel Needs Reach New Record

Personnel needs of the railroads reached a new high when, on September 1, the figure soared to 96,631, as reported to the Railroad Retirement Board. This is an increase of 17,432 persons over the shortages reported on August 1, 1943, and an increase of 55,451 compared with December 1, 1942. Of the 17,432 additional employees needed, approximately 15,000 are required by the 30 largest carriers.

During August, the board placed 36,090 persons but high labor turnover, the continuous drain of railroad workers by selective service and the return of students to school have left the railroad industry extremely short of personnel, the report of the board states. The greatest increase in needs occurred in the maintenance of way and structures groups and totaled about 8,000 over August figures. Approximately 7,000 of these are trackmen. The maintenance of equipment and stores and the transportation groups showed substantial increases of approximately 5,000 and 4,000 respectively during the month.

The needs as of September 1, 1943, by occupational groups are as follows:

Occupational Group	Needs Number	Per Cent	Surpluses
I Executive, official and professional	198	.2	0
II Clerical	2,037	2.1	0
III Maintenance of equipment and stores	27,068	28.1	26
IV Maintenance of way and structures	50,329	52.2	153
V Transportation	16,231	16.9	162
VI Miscellaneous	498	.5	29
Totals	96,361	100.	370

"Special" Wage Board Appointed for Non-Ops Hearing

President Roosevelt last month created another "special emergency board" to reconsider the non-operating employees' wage controversy, a procedure he adopted some time ago for a case involving the Pacific Electric at Los Angeles. However, as this issue of *Railway Engineering and Maintenance* went to press, leaders of the 15 non-op unions, meeting at Washington, D. C., had not reached a decision as to whether they would appear before the new board and on October 26 the heads of these unions joined the five operating brotherhoods in ordering a strike vote.

The "special" non-op board was created by an October 16 Executive Order, the three members being the same persons who served on the Pacific Electric "special" board which had submitted its report to the President on the previous day. They are: Elwyn R. Shaw, chief justice of the Supreme Court of Illinois; Richard F. Mitchell, former chief justice of the Supreme Court of Iowa; and Walter C. Clephane, Washington, D. C., attorney. They have the assignment which was refused by the original non-op board, headed by Dr. I. L. Sharfman, i. e., to reconsider the case in the light of Director Vinson's June 30 opinion rejecting the recommended eight-cents-per-hour increase.

In that opinion Mr. Vinson took the position that the Sharfman board's reliance on the "gross inequities" device as a way around the "Little Steel Formula" was not in accord with the stabilization program. He went on to suggest, however, that an increase for the lower-paid non-ops might well be justified from a "substandards of living" standpoint, with collateral adjustments for the purpose of preserving "interrelated job classification." Such collateral adjustments "should be tapered off so as to obviate the need so far as practically feasible for revisions in the higher wage brackets," Mr. Vinson added.

Eastman Declares Critical Six Months Ahead

In an address delivered before the New England Shippers Advisory Board at Boston, Mass., on October 6, Joseph B. Eastman, director of the Office of Defense Transportation, warned that "the next six months will be a critical period in railroad performance." Saying that he believed that the railroads, with the help of their customers and employees, will be able to maintain their record of superlative performance until they are "over the hump", Mr. Eastman appealed to his listeners to give "the few ounces of help in reserve" that should put the carriers "over the top" in this critical period immediately ahead. Among the reasons why the immediate future is so critical, according to the O. D. T. director, are equipment shortages, growing pressure on the roads that serve the Pacific coast, the advent of winter, diminishing aid from trucks and buses, man-power shortages, featherbed rules, and the effect of recent accidents on traffic.

Railroad Men Remove Live Enemy Mines in Africa

The personnel of the American Military Railway Service, Transportation Corps, in North Africa has recently taken over a new and dangerous job by becoming experts in the removal of land mines, booby traps and demolition charges planted by the enemy, according to a news dispatch released last month by the War Department. Under ordinary circumstances, the dispatch relates, the job of removing explosive charges is undertaken by the Corps of Engineers, but during the height of battle that organization is too often engaged in clearing a path for the advance of combat units and therefore cannot offer assistance to the railroads in the vicinity. As a means of eliminating delay in removing explosives in the path of railroad trains, selected railroad-soldiers were chosen from the various M.R.S. units and were then thoroughly trained in a mine and demolition technique under directions of Capt. Francis J. Murphy, a former Great Northern employee at Seattle, Wash.

Personal Mention

General

J. G. MacLachlan, superintendent and district engineer on the Hudson Bay (a subsidiary of the Canadian National), has been promoted to manager, with headquarters as before at The Pas, Man.

The Senate last month confirmed President Roosevelt's appointment of **Frank C. Squire,** valuation engineer of the Finance, Accounting, Taxation and Valuation department of the Association of American Railroads, to be railroad

Frank C. Squire

management's representative on the Railroad Retirement Board. Mr. Squire succeeds M. Roland Reed, Pennsylvania mechanical department officer, who has served on the R.R.B. since October, 1938.

Mr. Squire was born May 16, 1885, at Oil City, Pa., and received his higher education at Stanford University, from which he graduated in 1907. In the same year he entered railroad service as an assistant engineer, serving until 1912 with the Oregon-Washington Railroad & Navigation Company (now part of the Union Pacific), and with the Southern Pacific. From 1912 until 1914 he was valuation engineer with the Los Angeles & Salt Lake (now also part of the U.P.), and from 1914 until 1923 (except for military service in 1918) he held a similar position on the O.-W.R.&N. In 1923 Mr. Squire joined the Western Group of the President's Conference Committee on Valuation as engineer, remaining in that position until 1935 when he became associated with the A.A.R. as valuation engineer, the position he was holding at the time of his appointment to the Retirement Board, effective November 1.

Lt.-Col. Blair Ripley, C. B. E., D. S. O., formerly engineer, maintenance of way, eastern lines, of the Canadian Pacific, who has been assigned to special duties, as reported in the September issue, entered the service of the Canadian Pacific in 1907 as resident engineer of construction at Medicine Hat, Alta. Colonel Ripley was appointed assistant engineer at Toronto, Ont., in 1912, and undertook the work of grade separation at North Toronto the following year. During World War I he served with the labor battalion, and was decorated with the D. S. O. and C. B. E. Following the war, he returned to the Canadian Pacific, being appointed district engineer at Toronto on January 1, 1920. On October 1, 1938, Colonel Ripley became engineer maintenance of way of the Eastern lines, the position he was holding at the time of his recent assignment to special duties. He has served as honorary president of the Canadian Pacific Ex-Servicemen's Association for the Ontario district since its formation.

Leon V. Lienhard, whose promotion to superintendent of the Southern Kansas division of the Atchison, Topeka & Santa Fe was reported in the October issue of *Railway Engineering and Maintenance,* was born at Cuero, Tex., on September 26, 1891, and graduated from Texas A. & M. College. He entered railroad service in 1913 as a draftsman for the Santa Fe at Amarillo, Tex., subsequently serving in various capacities in the engineering department. In September, 1926, he was appointed acting roadmaster of the First and Canon City districts of the Colorado division, with headquarters at Pueblo, Colo., later being promoted to roadmaster. In 1929 he was advanced to division engineer, with headquarters at Slaton, Tex., and in 1931 he was appointed roadmaster, with headquarters at Pueblo. In July, 1937, Mr. Lienhard was advanced to acting division engineer at Dodge City, Kan., and later he was promoted to division engineer at Arkansas City. In July, 1938, he was advanced to district engineer on the Northern district, Western lines, with headquarters at La Junta, Colo., and a year later he was appointed trainmaster at La Junta, subsequently being transferred to Chanute and Arkansas City.

Engineering

Harry Homans, track supervisor on the Maine Central, with headquarters at Bangor, Me., has been promoted to assistant division engineer with the same headquarters.

M. R. Black, assistant trainmaster on the Louisville & Nashville at Loyall, Ky., has been promoted to assistant division engineer of the Evansville division and the St. Louis Terminals, with headquarters at Evansville, Ind.

H. I. Currie has been appointed office engineer of the Canadian National with headquarters at Montreal, Que., succeeding **J. A. Pearman,** who has retired after 42 years service in the engineering department of that road.

W. J. Kernan, supervisor of track on the New York Central with headquarters at Rochester, N.Y., has been promoted to assistant district engineer of the Boston & Albany, with headquarters at Boston, Mass.

C. T. Ray, roadmaster on the Southern Pacific at Hillsboro, Ore., has been promoted to assistant division engineer on the Shasta division, with headquarters at Dunsmuir, Cal., succeeding **D. H. Talt,** who has been assigned to other duties.

T. Fred Burris, whose promotion to division engineer of the Chicago-Petoskey division of the Pere Marquette, with headquarters at Grand Rapids, Mich., was reported in the October issue of *Railway Engineering and Maintenance,* was born at Sault Ste. Marie, Mich., on July 27,

T. Fred Burris

1899, and entered railway service on October 16, 1928, as a transitman on the Pere Marquette at Saginaw, Mich. In 1929 he was advanced to assistant engineer, with headquarters at Grand Rapids, and in May, 1943, he was promoted to acting division engineer, with the same headquarters, holding that position until his new appointment, effective September 15.

Frank Manning, whose retirement as division engineer on the Pere Marquette was reported in the October issue, was born at Arcadia, Wis., on June 3, 1873, and entered railway service in 1898 on construction work for the Chicago & North Western between Sanborn, Minn., and Burt, Iowa. Later he went with the Missouri-Kansas-Texas on location and construction work between Coffeyville, Kan., and Oklahoma City, Okla., and in 1903 he became a transitman on the Pere Marquette at Saginaw, Mich. In 1905 he was transferred to Grand Rapids, Mich., and in 1909 he was promoted to assistant engineer. In 1926 he was advanced to the position he held at the time of his retirement.

Charles V. Kitzmiller, an instrumentman on the panhandle division of the Chicago, Rock Island & Pacific at Liberal, Kan., has been promoted to special engineer in charge of flood control, with headquarters at Chicago, succeeding **James Erskine,** whose death on September 2 was reported in the October issue.

W. H. Huffman, acting division engineer of the Western division of the Chicago, St. Paul, Minneapolis & Omaha, has been promoted to division engineer of the Western division, with headquarters as before at St. Paul, Minn., succeeding **J. C. Bock,** who has been granted leave of absence at his own request. **H. W. Jensen,** acting division engineer of the Eastern division, has been advanced

to division engineer of the Eastern division, with headquarters as before at St. Paul, Minn.

G. N. Edmondson, engineer maintenance of way, in charge of the Lines Buffalo and East, of the New York Central, retired on September 30, after 42 years service. Mr. Edmondson has been on leave of absence because of ill health since last June, and **John H. Kelly** has been serving as engineer maintenance of way, Lines East, with headquarters at New York. Mr. Edmondson was born at New Haven, Conn., on August 22,

G. N. Edmondson

1879, and entered the service of the New York Central in July, 1901, in the engineering corps. In July, 1903, he became assistant supervisor of track and subsequently supervisor of track. He served as assistant engineer and assistant engineer of track of the Hudson and New York divisions from November, 1905, to May, 1907, when he became supervisor of track at West Albany, N.Y. In March, 1910, Mr. Edmondson was appointed assistant division engineer at Utica, N.Y., and was promoted to division engineer at Rochester, N.Y., in April, 1911, being transferred to Jersey Shore, Pa., in 1918, and to Albany, N.Y., in June, 1920. He was appointed engineer of track at New York in October, 1927, and was promoted to engineer maintenance of way, Lines East, in June of last year, a position which he held until his retirement, effective September 30.

Gustav V. Granlun, assistant supervisor of track of Subdivision No. 13, of the Buffalo division of the New York Central, with headquarters at Buffalo, N.Y., has been promoted to supervisor of track of Subdivision No. 30 of the same division, with headquarters at Rochester, N. Y., to succeed **John E. Smith,** who has been transferred to Subdivision No. 11 of the Syracuse division, with headquarters as before at Rochester. Mr. Smith succeeds **W. J. Kernan,** whose appointment as assistant district engineer of the Boston & Albany is noted elsewhere in these columns. **John Cillo,** an extra gang foreman, has been promoted to assistant supervisor of track of Subdivision No. 27 of the Pennsylvania division, with headquarters at Clearfield, Pa., to succeed **Leslie G. Bell,** who has been transferred to Subdivision No. 13 of the Buffalo division, with headquarters at Buffalo to replace Mr. Granlun.

L. L. Adams, engineer maintenance of way of the Louisville & Nashville, has been promoted to assistant chief engineer, with headquarters as before at Louisville, Ky. **Edward Wise Jr.,** has been appointed engineer maintenance of way, with headquarters at Louisville, succeeding Mr. Adams.

Mr. Adams was born at Harrodsburg, Ky., and graduated in civil engineering from Kentucky State University in 1911. He entered the service of the L. & N. in May of the same year as a rodman in the construction department, serving in this position and as an inspector, assistant resident engineer and resident engineer until May, 1913. At that time he entered the office of the chief engineer as a draftsman, and after a year in this capacity he was appointed an assistant engineer on maintenance, with headquarters at Nashville, Tenn. In May, 1917, Mr. Adams enlisted in the United States Army, being commissioned a captain and serving in France with the Eighty-second Division Engineers for 11 months. On July 9, 1919, he returned to the L. & N. as an assistant engineer in the chief engineer's office, being appointed headquarters supervisor in the roadmaster's office at Ravenna, Ky., on October 1 of the same year. In July, 1920, he was promoted to

L. L. Adams

roadmaster, with headquarters at Etowah, Tenn., and was transferred to Louisville, Ky., on February 1, 1925. He was advanced to division engineer, with headquarters at Evansville, Ind., on July 1, 1931, and in April, 1936, he was promoted to engineer maintenance of way, the position he held at the time of his new appointment, effective October 1.

Mr. Wise was born at Henderson, Ky., on January 15, 1894, and attended the University of Kentucky. He entered railway service on June 9, 1913, as a rodman for the L. & N. at Lexington, Ky., and was appointed an assistant resident engineer in the construction department in January, 1914. He left the service for a few months in 1917, but returned to the L. & N. on August 27, 1917, as a draftsman. Mr. Wise was appointed an assistant engineer on January 24, 1919, with headquarters at Louisville, and was promoted to special engineer in charge of grade separation work at Birmingham, Ala., on May 1, 1928. He remained there until June 1, 1933, when he was appointed division engineer at Pensa-

Edward Wise, Jr.

cola, Fla., and on April 1, 1936, he was transferred to Evansville, Ind. He was appointed assistant engineer in the chief engineer's office at Louisville in March, 1942, but before assuming these duties he went to Washington, D.C., on a temporary assignment as principal business consultant in the Transportation Equipment Branch of the War Production Board. He returned to Louisville on September 1, 1942, and was promoted to engineer of maintenance of way on October 1, 1943.

E. H. McGovern, assistant district engineer on the New York Central, has been promoted to district engineer, with headquarters as before at Cincinnati, Ohio, succeeding **Paul Hamilton,** who has retired, effective November 1. **G. T. Donahue,** division engineer at Chicago, has been advanced to assistant district engineer at Cleveland, Ohio, replacing **E. J. Bayer,** who has been transferred to Cincinnati, succeeding Mr. McGovern. **A. A. Keever,** assistant engineer in the district engineer's office at Cleveland, has been promoted to division engineer at Mattoon, Ill., relieving **J. R. Scofield,** who has been transferred to Chicago, replacing Mr. Donahue; and **Max Nearing,** track supervisor at Jackson, Mich., has been advanced to assistant engineer in the office of the district engineer at Cleveland, succeeding Mr. Keever.

Loren F. Pohl, assistant engineer on the Chicago, Milwaukee, St. Paul & Pacific at La Crosse, Wis., has been promoted to division engineer of the Kansas City division, with headquarters at Ottumwa, Iowa, succeeding **W. E. Ross,** who has been granted leave of absence to become a lieutenant (jg) in the United States Navy.

N. D. Hyde, special engineer in the office of the chief engineer of the New York Central System, West of Buffalo, has been promoted to assistant to the chief engineer of the Lines West of Buffalo, with headquarters at Chicago, a newly-created position, and the position of special engineer, New York Cen-

(Continued on page 898)

Don't Let THIS Happen To YOUR TIES

Prolong TIE LIFE *With*

BEEGLE SAF-TIE IRONS

Prevent Radial Splitting and Checking

In these days when it is impossible to secure enough ties to meet requirements, it is imperative that every tie be protected against all avoidable deterioration while awaiting insertion as well as during service in track. Beegle Saf-Tie Irons are scientifically designed to prevent radial splitting and checking of ties. Manufactured in accordance with A. R. E. A. specifications, Beegle Saf-Tie Irons are designed to fit all standard sizes of ties. They provide these outstanding features:

(1) They reinforce both the upper and lower areas of the end sections of the tie against splitting;
(2) They provide a balanced reinforcing, which neutralizes the normal tendency of the tie to split and prevents the spreading of the resultant sections;
(3) They provide marginal defense in the areas of sap-wood where splitting begins and is most severe;
(4) They prevent the eventual exposure of untreated wood.
(5) They add substantial mechanical strength to the natural unitary strength of the tie.

A Good Application of Beegle Saf-Tie Irons.

It Is Essential To Save Ties At All Times—Especially TODAY

By spending a dime a tie now for the application of two Beegle Saf-Tie Irons in each end, years can be added to the life of ties. Will you invest pennies today to save dollars immediately as well as during the years to come?

Write us for full particulars

BEEGLE
TIE SERVICE COMPANY
EAST ST. LOUIS ILLINOIS

tral System, West of Buffalo, has been abolished. Mr. Hyde was born at Afton, N.Y., on November 19, 1889, and is a graduate of Union College. He entered railroad service in September, 1912, as a

N. D. Hyde

rodman for the New York Central at Utica, N.Y., and in June, 1917, he became an engineer in the New York State engineering department. In August of the same year he was commissioned a lieutenant in the Engineer's Corps of the U.S. Army and served 12 months with the A.E.F. in France. In March, 1919, Mr. Hyde returned to the New York State engineering department, and in May, 1922, he became an assistant engineer on the New York Central. In November, 1935, he was promoted to special engineer in the office of the vice-president, with headquarters at Chicago, and three years later he was advanced to special engineer in the office of the chief engineer, West of Buffalo, holding that position until his new appointment, effective October 1.

Track

Thomas Walker, roadmaster on the Evansville division of the Louisville & Nashville, with headquarters at Evansville, Ind., has retired.

E. J. Elston, supervisor of track on the Delaware, Lackawanna & Western, with headquarters at Elmira, N.Y., has been promoted to roadmaster with the same headquarters, to succeed **A. F. Geary,** resigned.

John H. Wahlman has been appointed assistant supervisor of track of Subdivision No. 1, of the Boston division of the Boston & Albany, with headquarters at Allston, Mass.

W. J. Mountain has been appointed assistant track supervisor on the Boston division of the New York, New Haven & Hartford, with headquarters at Taunton, Mass.

A. L. Sams, an instrumentman on the Illinois Central at Clinton, Ill., has been promoted to supervisor of track, with headquarters at Olney, Ill., succeeding **P. A. Cosgrove,** who has been transferred to Clinton, replacing **P. R. Henderson,** who has been granted leave of absence.

G. E. Ashby, section foreman and relief roadmaster on the Canadian National at Orrville, Man., has been promoted to roadmaster, with headquarters at Portage la Prairie, Man., succeeding **A. S. Wilson,** who has been transferred to Fort Rouge, Man.

T. H. Nelson, roadmaster on the Southern Pacific at Glendale, Ore., has been transferred to Colfax, Cal., succeeding **H. H. Notley,** who has retired. **C. E. Neal,** roadmaster at Niles, Cal., has been transferred to Dunsmuir, Cal., replacing **J. O. Johnson,** who has been transferred to Glendale, succeeding Mr. Nelson. **R. T. Henderson** has been appointed roadmaster at Niles, replacing Mr. Neal.

Algernon S. Dodge, assistant track supervisor of District No. 2 of the Maine Central, with headquarters at Brunswick, Me., has been promoted to track supervisor of District No. 1, with headquarters at Bartlett, N.H., to succeed **Carl T. Davis,** who has been transferred to District No. 5, with headquarters at Bangor, to replace **Harry Homans,** whose appointment as assistant division engineer is noted elsewhere in these columns. **William D. Blake** has been appointed assistant track supervisor on District No. 3, with headquarters at Lewiston, Me., to succeed **Wesley M. Martin,** who has been transferred to District No. 2, at Brunswick, to replace Mr. Dodge.

Bridge and Building

William V. Kerns, assistant supervisor of bridges and buildings on the Iowa division of the Chicago & North Western at Boone, Iowa, has been promoted to supervisor of wood preservation in charge of the tie and timber treating plant at Escanaba, Mich., succeeding **H. L. Holderman,** who has been advanced to acting division engineer on the Black Hills division.

James Lundie, bridge and building master on the Canadian Pacific at Regina, Sask., has been promoted to division engineer, with headquarters at Moose Jaw, Sask., succeeding **R. A. Emerson,** assigned to other duties. Mr. Lundie was born at St. Thomas, Ont., on April 10, 1907, and graduated from the University of Saskatchewan in 1930. He entered railway service in May, 1928, as a transitman on the Canadian Pacific at Moose Jaw. On January 1, 1939, Mr. Lundie was promoted to the position he held at the time of his new appointment.

Raymond E. Mull, assistant master carpenter on the Philadelphia division of the Pennsylvania at Harrisburg, Pa., has been promoted to master carpenter on the Toledo division, with headquarters at Toledo, Ohio, succeeding **H. M. Dick,** who has been transferred to Columbus, Ohio. Mr. Mull was born at Ephrata, Pa., on June 29, 1891, and entered railway service with the Pennsylvania on May 25, 1916, as a carpenter on the Philadelphia division, with headquarters at Harrisburg. In 1929 he was advanced to acting assistant master carpenter at Baltimore, Md., and when that position was abolished in 1932, he was appointed foreman carpenter, with headquarters at Enola, Pa. On December 1, 1942, Mr. Mull was promoted to the position he held at the time of his new appointment.

N. R. Robinson has been appointed supervisor of bridges and buildings on the Southern Pacific, with headquarters at Sacramento, Cal., succeeding **L. A. Warren,** who has retired.

Special

James C. Ryan, supervisor of welding on the New York Central system, with headquarters at Cleveland, Ohio, has been promoted to superintendent of maintenance equipment, Lines West of Buffalo, with headquarters at Chicago, a newly-created position. Mr. Ryan was born at Chicago on November 14, 1889, and entered railway service with the New York Central in August, 1923, as an inspector in the office of the consulting engineer at Chicago. On October 1, 1933, Mr. Ryan was promoted to the position he held at the time of his new appointment, effective September 1.

Obituary

C. Carver, bridge and building master on the Canadian National at Winnipeg, Man., died recently.

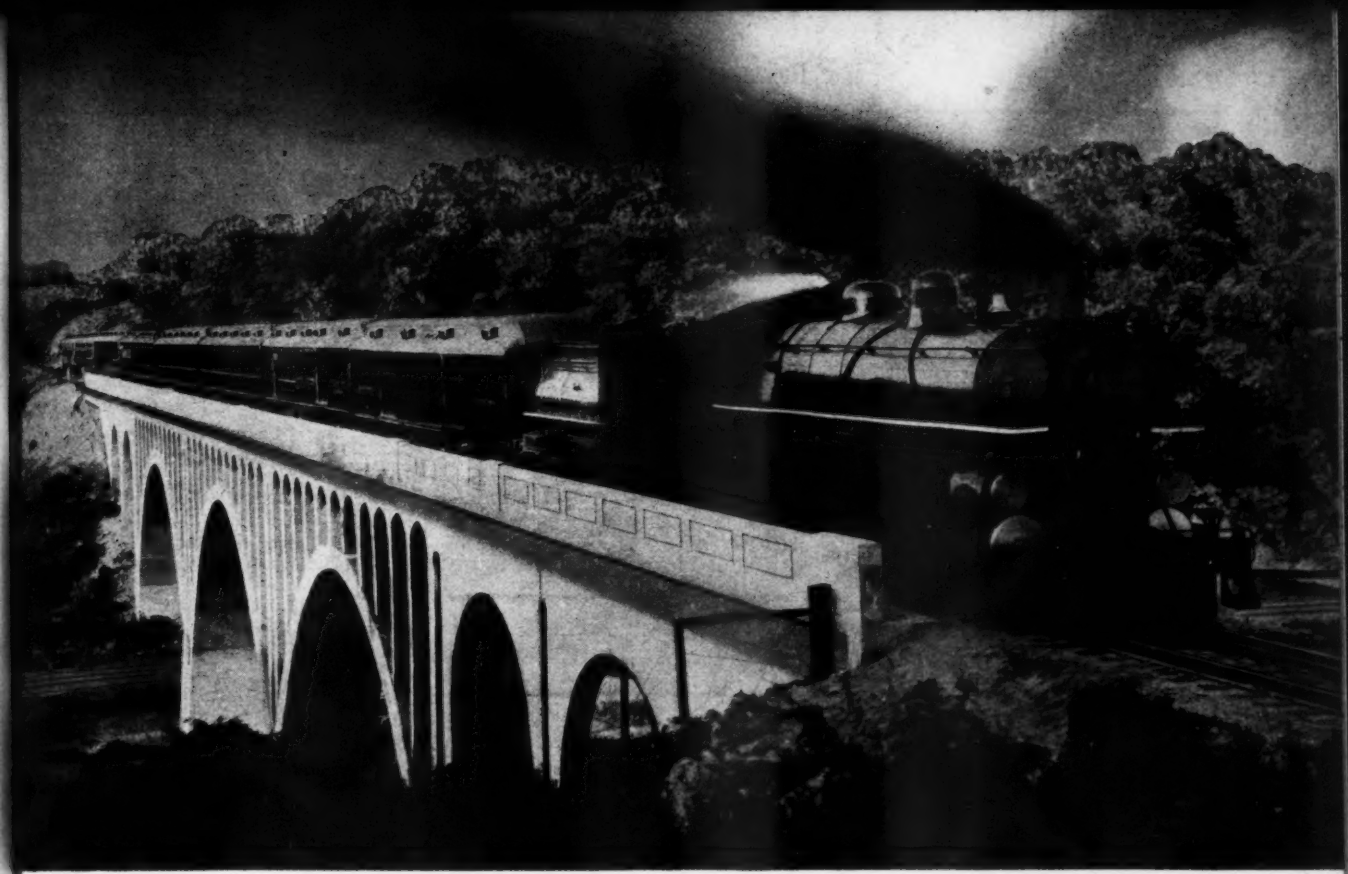
James J. Main, who retired in 1932 as track supervisor on the Central of Georgia, died at Eufaula, Ala., recently.

James A. Morris, who retired in 1937 as roadmaster on the Missouri Pacific, with headquarters at Dermott, Ark., died at his home in Dermott recently.

E. Rushby, retired roadmaster on the Canadian National at Vancouver, B.C., died recently.

J. E. Floyd, principal industrial engineer of the Rail Division, Transportation Corps, War Department, died recently in an airplane accident while traveling on a tour of duty. Mr. Floyd, who was 68 years of age, had been with the War Department since 1941. He was in railroad service for many years, having been a former assistant valuation engineer for the Great Northern and an assistant engineer with the Western Group of the Railroad Presidents' Conference Committee on Valuation.

Samuel L. Wonson, assistant chief engineer of the Missouri Pacific, with headquarters at St. Louis, Mo., died suddenly at his home in that city on October 1. Mr. Wonson was born at Gloucester, Mass., on July 1, 1877, and graduated from Harvard College in 1899 and from the Massachusetts Institute of Technology in 1901. He served as an instructor in the latter institution for one year and then went with the American Bridge Company as a draftsman and assistant engineer. In 1907 Mr. Wonson was appointed assistant bridge engineer of the National Railways of Mexico, with headquarters at Mexico City. In 1910 he was appointed assistant bridge engineer of the Missouri Pacific and later he was promoted to bridge engineer. In 1924 Mr. Wonson was advanced to assistant chief engineer, with headquarters at St. Louis, and from 1932 to 1940 he served as acting chief engineer, with the same headquarters.



GUARDED AGAINST AIRBORNE ATTACK . . .

PROTECTING railroad concrete against the disintegrating effect of freezing and thawing . . . this is the important job of POZZOLITH — Cement Dispersion.

Greatly improved durability is only one of the reasons why railroads and other industries have used Pozzolith — Cement Dispersion — in hundreds of major projects. Pozzolith speeds the work through earlier removal of shores and forms and measurably lowers labor costs.

Among the railroads that have been using Pozzolith Concrete over the past 11 years are:

ATCHISON, TOPEKA & SANTA FE RAILWAY
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ERIE RAILROAD
GREEN BAY & WESTERN RAILROAD
LOUISVILLE & NASHVILLE RAILROAD
NEW YORK CENTRAL RAILROAD
NEW YORK, CHICAGO, ST. LOUIS RAILROAD
PERE MARQUETTE RAILWAY
SOUTHERN RAILWAY
UNION PACIFIC RAILROAD
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Find out the benefits of Pozzolith — Cement Dispersion * — for your job. Wire or write for complete information and illustrated Pozzolith booklet.

THE MASTER BUILDERS COMPANY
CLEVELAND 3, OHIO • TORONTO, ONTARIO

**Other Master Builders Products employing Cement Dispersion which are serving the Construction Industry to produce faster, better, more economical results: MASTERPLATE for heavy duty floors; EMBECO for non-shrink concrete grouts and repairs; OMICRON MORTARPROOFING for masonry mortars.*

MASTER BUILDERS

Association News

Roadmasters' Association

President Banion is arranging for a meeting of the Executive committee in Chicago on November 8 to organize the work and appoint committees for the ensuing year.

Wood-Preservers' Association

At a meeting of the Executive committee in Chicago on October 20, it was decided to hold the next annual meeting of the association at the Palmer House, Chicago, on April 25, 1944.

Bridge and Building Association

Immediately following the conclusion of the wartime conference in Chicago on October 21, the newly elected officers of the association met to organize the work for the ensuing year. It was decided to send a questionnaire promptly to members of the association soliciting volunteers for committee work, the returns from which will guide the Executive committee in its appointment of committees at a meeting to be held in Chicago on December 6.

Maintenance of Way Club of Chicago

One hundred and sixty-five members and guests, a record attendance for an October meeting, and the fourth largest attendance in the history of the club, were present at the first fall meeting of the club, which was held in the Ambassador Room of Huyler's Restaurant in the Straus Building, Chicago, on the evening of October 25. The program of the meeting, following dinner, consisted of a symposium on What Happened in Maintenance During the Past Summer, by four speakers: E. J. Brown, engr. of track, Chicago, Burlington & Quincy; J. E. Fanning, asst. to ch. engr., Illinois Central; A. B. Hillman, engr. m. of w., Chicago & Western Indiana—Belt Railway of Chicago; and J. F. Swenson, div. engr., Pennsylvania.

The next meeting of the club to be held on November 22, will be addressed by G. M. O'Rourke, asst. engr. m. of w., Illinois Central, Chicago, who will describe a recently completed 20-mile section of test tracks in the main line of his road, just north of Kankakee, Ill., which includes a wide range of tests of ties, tie plates, anti-creepers, joint bar assembly, asphalt-coated ballast, etc.

American Railway Engineering Association

Four standing committees of the association have scheduled meetings during November: Records and Accounts, at Cincinnati, Ohio, on November 2 and 3; Buildings, at New York, on November 3 and 4; Economics of Railway Labor, at Chicago, on November 11; and Co-Operative Relations with Cniversities, at Evanston, Ill., on November 15.

During October, the September-October bulletin of the association, No. 440, was mailed to members, with contents as noted in the October issue. About the middle of November, members will receive copies of the November bulletin, No. 441, which will contain the current reports of the committees of Economics of Railway Location and Operation, Electricity, Signals, Waterways and Harbors, and Water Service, Fire Protection and Sanitation.

Four committees held meetings during October, two concurrent with the war-time conference of the American Railway Bridge and Building Association. The committees which met included the following: Masonry, at Chicago, on October 6 and 7; Rail, at Chicago, on October 20; Water Service, Fire Protection and Sanitation, at Chicago, on October 20; and Iron and Steel Structures, at Pittsburgh, Pa., on October 28 and 28.

Supply Trade News

Personal

Paul E. Floyd, who has been on leave of absence in the iron and steel branch of the War Production Board, has resumed his former position as district manager in the Chicago branch office of the **Allegheny Ludlum Steel Corporation.**

John S. Hutchins, district sales manager of the **Ramapo-Ajax division of the American Brake Shoe Company,** with headquarters at Chicago, has been elected vice-president of this division with the same headquarters. Mr. Hutchins was born in 1905 and was graduated from Yale University. He entered the employ of Ramapo-Ajax in 1925 and was taken into the sales department in Chicago in 1927. He was later transferred to the Cleveland office and returned to Chicago in 1933, where he remained in charge of

John S. Hutchins

sales of the Chicago district until his appointment as district sales manager of middle Western sales in 1941.

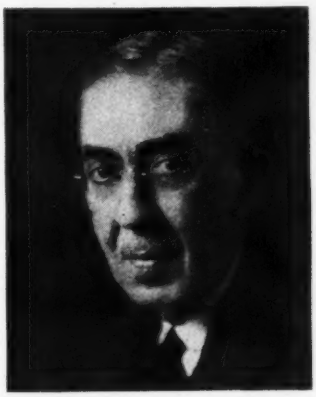
John W. Murphy, whose promotion to manager of sales, rails and accessories of the **Bethlehem Steel Company** was reported in the October issue, joined the Bethlehem Steel Company in 1923 and served in the Boston, Mass., office from 1923 to 1926, and in the Baltimore, Md., office from 1926 to 1940, during the last three years of which he was assistant manager of sales. He was transferred to Bethlehem, Pa., as acting manager of sales, rails and accessories, on January 1, 1943. Prior to joining the Bethlehem Steel Company, Mr. Stoll was employed in the engineering department of the Pennsylvania as inspector of materials from 1902 to 1912.

Obituary

Clifford E. Ward, in charge of sales of the U. S. Pump & Engine Company, Batavia, Ill., died in that city on September 28. Mr. Ward was vice-president of the Bridge and Building Supply Men's Association in 1937, and was a director of the National Railway Appliances Association from 1940 to 1943.

George T. Ladd, chairman of the board of the Woodings Forge & Tool Co., and the Woodings-Verona Tool Works, and president of the United Engineering & Foundry Company, died on October 3, at Pittsburgh, Pa., after an extended illness.

Charles Wescott Gennet, Jr., vice-president of Sperry Rail Service, Chicago, died suddenly at his home in that city on October 26. Mr. Gennet was born at Binghamton, N.Y., on August 1, 1876, and



Charles Wescott Gennet, Jr.

graduated in mechanical engineering from Cornell University in 1898. Immediately after leaving school he entered the employ of the Baldwin Locomotive Works and a year later he entered the testing department of the Southern at Alexandria, Va., where he remained until 1907. He then went with the Robert W. Hunt Company, Chicago, as manager of the St. Louis (Mo.) office and was promoted to manager of the rail department, with headquarters in Chicago, in 1909. In January, 1928, he resigned to become vice-president, with headquarters at Chicago, of the newly-organized Sperry Rail Service Company, Hoboken, N.J. (now Sperry Rail Service), since which time Mr. Gennet has been closely associated with the development of the Sperry rail detector car.

NO NEED to tell railroad maintenance men how vitally important track upkeep is these days; this is one of your most pressing problems.

But thanks to the modern equipment that is available, this and other maintenance difficulties consistently are being overcome.

Shown in the photograph is an Ingersoll-Rand Model KRC-16 Crawl-Air Compressor equipped with Timken Tapered Roller Bearings on the compressor crank shaft, operating 16 I-R MT-3 Tie Tampers with a full crew.

The use of Timken Bearings is a strong factor of performance, endurance and economy in all kinds of railroad equipment—from modern main line steam locomotives and streamlined trains to section motor cars and trailers. Make sure you have them in the new equipment you buy, wherever wheels and shafts turn. The Timken Roller Bearing Company, Canton, Ohio.

Post-war competition will be tough. Meet it and beat it with redesigned equipment, using more Timken Bearings.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

There are many new "peddlers" in railway offices these days, but—

—Railway Engineering & Maintenance keeps the older companies before their customers all the time.

"Looking To Post War"

"Boss, I'm running into a lot of new 'peddlers' in railway offices these days," said the star salesman to his railway sales manager.

"Replacing men gone into service?" questioned the railway sales manager.

"In part, yes, but a lot of 'em represent companies I've never heard of."

"How come?"

"They've all got something to sell these railway maintenance officers."

"Like what?"

"A lot of them have entirely new products—new developments or adaptations from other industries. Others are trying to cut in on old companies."

"Trying to get established with the railways for post war business, I suppose."

"That's it. They realize that the railways will present one of the biggest markets after the war. We'll be lucky if some one doesn't start in on us."

"Perhaps they will. We have no monopoly on railway good will except as we earn it."

"That's true, Boss, but—"

"But what?"

"We've got to look to *our* post war sales, too."

"That's right. What's in your mind?"

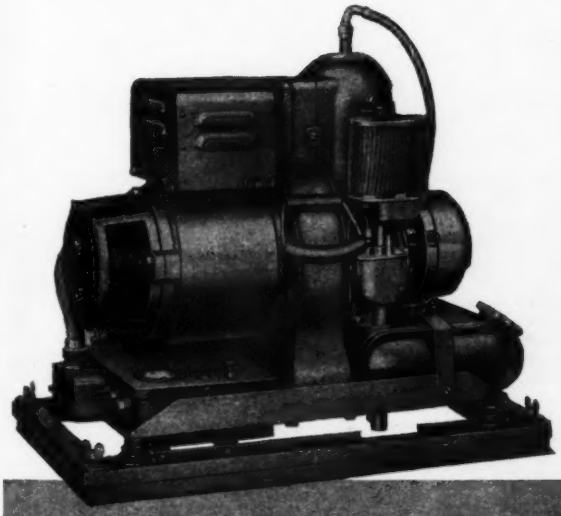
"More advertising in *Railway Engineering and Maintenance*. It'll keep us before these maintenance officers between my calls and it'll reach a lot of the new men before I can get around to see them."

"That's right, Bill. And it'll maintain contact with the men in the out of way places that you can't ever get to."

"They're important too—we can't tell where an order may start. This advertising helps me a lot."

"I know it does, Bill—especially now when these railway men are making up their programs for next year. We can't afford to let them forget us."

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS



NEW
HOMELITE
PORTABLE GENERATORS

That's a tough question to answer. The war might last for years. Then again it might end soon. Who knows? Your best bet is to take the optimistic path. Include something in your next year's budget for new Homelite Portable Generators and send in a tentative order. The early orders on our books get first delivery. And it might well be that deliveries will start earlier than you expect.

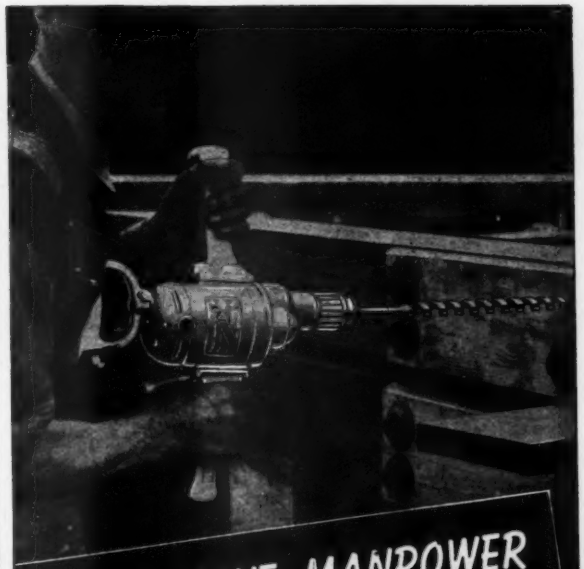
By the way, the new Homelite units will be worth getting. We've made many remarkable developments in our designs and construction . . . improvements that will benefit you.

ARMY E NAVY

Right now Homelite Workers are Backing the Attack by increasing production and buying War Bonds regularly. After the war, those men and women will work just as hard . . . just as conscientiously . . . for you.

HOMELITE CORPORATION

PORT CHESTER, NEW YORK



YOU'LL SAVE MANPOWER WITH THE DRILLING POWER OF SKILSAW DRILLS!

● Your Bridge and Building Crews will get more work done . . . *in less time* . . . when they're equipped with SKILSAW DRILLS. These tools have the *extra* power that means *extra* speed on every operation . . . from lightest repair drilling to deepest boring in bridge timbers. Yet SKILSAW DRILLS are lighter, more compact . . . for *easier* handling on *more* jobs!

If you want to see for yourself, just ask your distributor to demonstrate SKILSAW DRILLS . . . boring holes for lag spikes and hook bolts, reaming in steel or speeding up other tough drilling jobs. Phone your distributor *today!*

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SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

Make 50 to 60 Minutes of Every Work Hour Productive . . .

LeTourneau Model X Carryalls with "Caterpillar" R5 tractors widening shoulders of Southern Pacific and Great Northern Railway's joint line in Oregon to reinforce track bed, provide better drainage and permit more adequate snow removal.

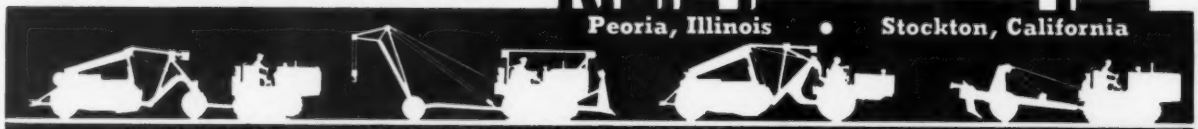
by Using LeTourneau Off-Track Earthmoving Equipment

A LeTourneau Carryall Scraper with "Caterpillar" Diesel tractor is a complete earthmoving unit. It digs its own load . . . no shovel or other loading unit required. It transports its own load from cut to fill, then spreads that load and finishes the grade. It works off-track . . . does not interfere with train schedules . . . eliminates need for special work trains and continual switching or construction of temporary spurs. Result: You get 50 to 60 productive minutes out of each work hour. One man operates both tractor and Carryall Scraper . . . no large hand labor crews needed. Tractor can be detached easily and quickly from Scraper for use with LeTourneau Dozer, Crane or Rooter. Used by many of country's leading railroads.

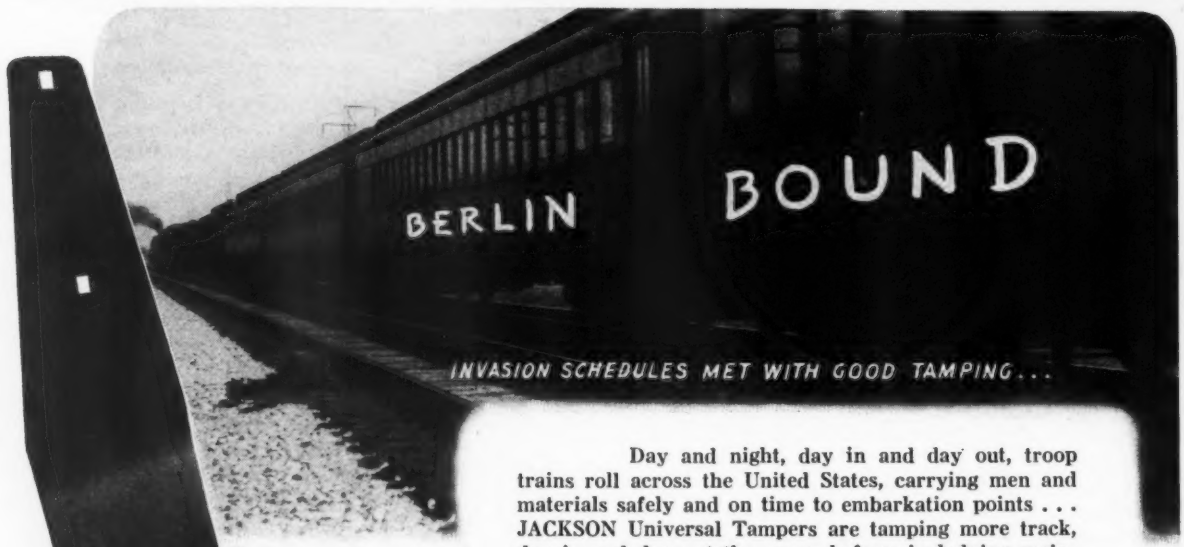
Plan now to profit from this work-increasing equipment. For additional information on use and operation of LeTourneau equipment, write for illustrated, data-packed Bulletin A-37.

R. G. LETOURNEAU INC

Peoria, Illinois • Stockton, California



HEAVY CONSTRUCTION EQUIPMENT

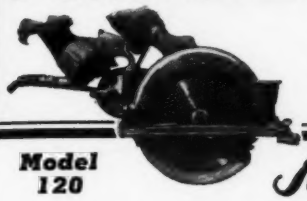


Day and night, day in and day out, troop trains roll across the United States, carrying men and materials safely and on time to embarkation points . . . JACKSON Universal Tampers are tamping more track, day in and day out than ever before, in helping maintain these vital schedules.

A tamping blade of many applications, the U-606 Gravel and Rock Blade is most efficient in tamping in gravel and small rock or slag ballast up to 1½" in size. It is particularly effective in moderate to high raises. Useful for spotting in the lighter ballasts. Write for booklet, "Jackson Tampers — How to Use and Maintain Them."

ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON MICHIGAN

EASE the Labor Shortage with Mall TRADE MARK PORTABLE POWER Tools



Model 120

Mall Saw TRADE MARK

12" Blade—4 5/8" Cutting Capacity
Also Pneumatic Models

For extensive sawing and ripping heavy lumber and timbers. Also operates an abrasive wheel for sawing non-ferrous metal up to ½" in thickness, cutting and scoring tile, stone and concrete.

Mall CHAIN SAW TRADE MARK

5 H.P. **GASOLINE ENGINE MODEL**

36" Capacity.
Also available in 24" and 48" sizes.
Also Pneumatic Models

Cuts heavy timber and piling in a fraction of the time required by hand. Automatic clutch prevents stalling the engine when saw is forced or pinched too hard. Swivel feature permits cuts at necessary angles. Easily and quickly sharpened on the job.

1½ H.P.

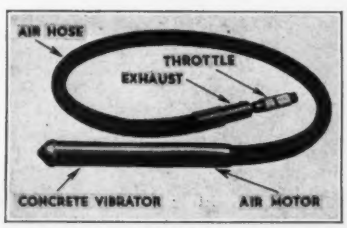
Mall TRADE MARK **CONCRETE VIBRATORS**

Gasoline Engine Model

Places low-water-cement-ratio concrete quickly and efficiently, assuring a strong, water-tight job free from honeycombs and voids that require hand patching. Variable speed engine operates eight other tools. Also 3 H.P. with round base or wheel barrow type mounting.

7500 r.p.m. Pneumatic Model

For placing concrete in tunnels, caissons and other deep construction Equipped with twist hand throttle for easy operation.



ARMY E NAVY

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Communications
AS MODERN AS AT HOME

At war, code messages flash between advanced posts and control centers. For speed and accuracy, teletypes are used, their vital electric power supplied by gasoline engine-driven generators. Another of the hundreds of uses for the hundreds of thousands of dependable Briggs & Stratton 4-cycle, air-cooled gasoline engines now serving our armed forces.

Our experience gained in meeting new production highs—and, at the same time, constantly maintaining Briggs & Stratton standards for precision, quality, durability and economy—will be equally important and advantageous when we again resume peacetime production.

Our customers, and the owners and users of Briggs & Stratton gasoline engines, will find an even "improved" service and a "better" product, to maintain our recognized position as builders of "*the world's finest air-cooled gasoline engines.*"

Can we help you now, on present wartime needs, or post-war planning?

"It's powered right — when it's powered by Briggs & Stratton."

BRIGGS & STRATTON CORP.
MILWAUKEE 1, WIS., U. S. A.

ENLIST YOUR DOLLARS
BUY WAR BONDS

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

THIS DECK LAYOUT *Saves* MAINTENANCE TIME.....

on AMERICAN LOCOMOTIVE CRANES

The deck machinery is spread out to make all parts easy to get at. No pyramiding of parts. Mast does not have to be taken down to get at machinery on the deck.

Air tanks, control valves and pipes are at front of the machinery deck between the boom seats—NOT over the deck machinery.

These superior features of design save maintenance time.

Catalog No. 600-L-1A "tells all" *write for your copy*

60 Years of Safety 1883 - 1943 The Genuine CROSBY CLIP

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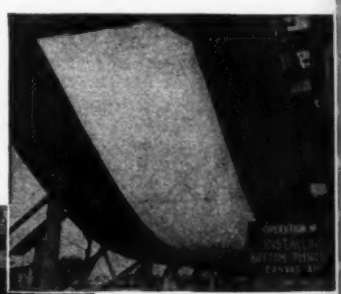
SAINT PAUL 1, MINNESOTA
Chicago San Francisco New York

AMERICAN TERRY DERRICK CO. . . . South Kearny, N. J.

Douglas Fir Plywood
INVASION BARGES
made for United Nations!

● Add invasion barges to the long list of war jobs Douglas Fir Plywood is doing. This sturdy, lightweight engineered lumber is being used for transportation equipment of all kinds, for military and war worker housing, for factory construction and scores of other purposes. Because of this wide and varied experience, you're sure to find Douglas Fir Plywood one of your most useful post-war construction materials.

● Here's another type of plywood barge — officially known as a lighter — built by Higgins Industries, Inc., of New Orleans. Sides and decks of these 18x64-foot barges are covered with 2 layers of ⅜-inch Exterior-type Douglas Fir Plywood. This Miracle Wood adds rigidity, is quickly applied and easily repaired if damaged.



● *(Above)* The bottom skin of these Higgins lighters consists of *(from left)* outer planking, a layer of thoroughly waterproofed canvas and an underlay of ⅜-inch Exterior-type Douglas Fir Plywood. The Higgins Industries use vast quantities of plywood in the many types of auxiliary vessels they are building.

TO HELP SPEED **VICTORY** the Douglas Fir Plywood Industry is devoting its entire capacity to war production. We know this program has your approval.

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Scores of actual photographs show plywood's busy war career. Write Douglas Fir Plywood Association, Tacoma Bldg., Tacoma, Washington, for YOUR copy.

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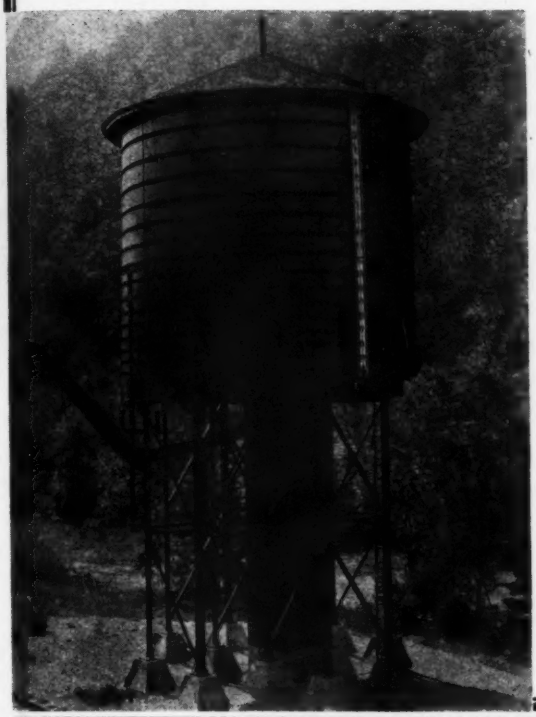
Real Lumber

MADE LARGER, LIGHTER
SPLIT-PROOF
STRONGER

U. S. ENGINE & PUMP CO.



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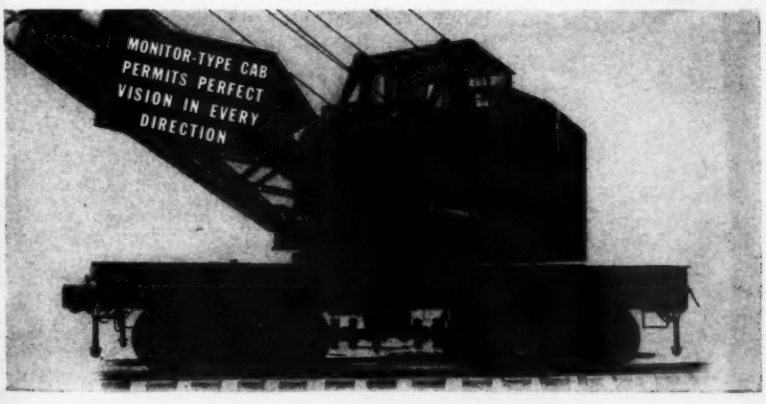
U. S. Engine & Pump Co.
Division of Batavia Metal Products, Inc.
BATAVIA • ILLINOIS

360° VISIBILITY WITH I. B. CRANES



In these days when the speed of victory depends greatly on the speed of production, the advantages of the patented Monitor-type cab on I. B. Cranes are more important than ever before. These cabs, available on I. B. Gas or Diesel locomotive cranes from 10 through 40 tons, increase operator efficiency by 1) providing 360° visibility, 2) improving ventilation and 3) reducing motor noise and heat in the cab.

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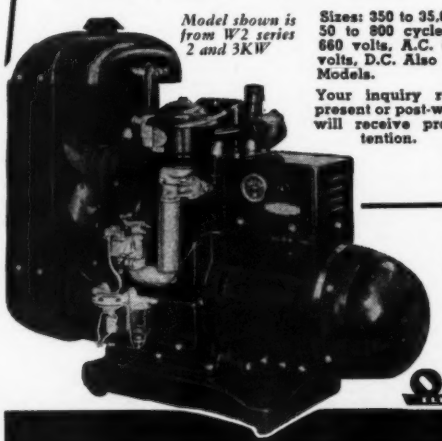

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Four Now Erected by Us
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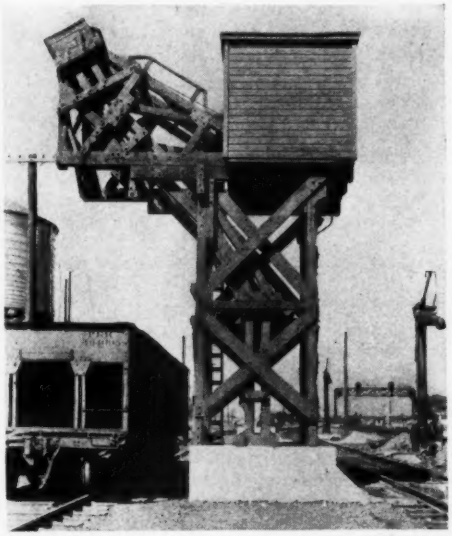

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Railway Engineering and Maintenance published monthly at Chicago, Ill., for Oct. 1, 1943.

State of Illinois } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Elmer T. Howson, who having been duly sworn according to law, deposes and says that he is the Editor of the Railway Engineering and Maintenance and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Simmons-Boardman Publishing Corp., 105 W. Adams St., Chicago, Ill.; Editor, Elmer T. Howson, 105 W. Adams St., Chicago, Ill.; Managing Editor, Neal D. Howard, 105 W. Adams St., Chicago, Ill.; Business Manager, F. C. Koch, 30 Church St., New York, N.Y.

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ELMER T. HOWSON, Editor.

Sworn to and subscribed before me this 1st day of October, 1943.

[SEAL] ANNE A. BOYD.

(My commission expires Dec. 10, 1943.)

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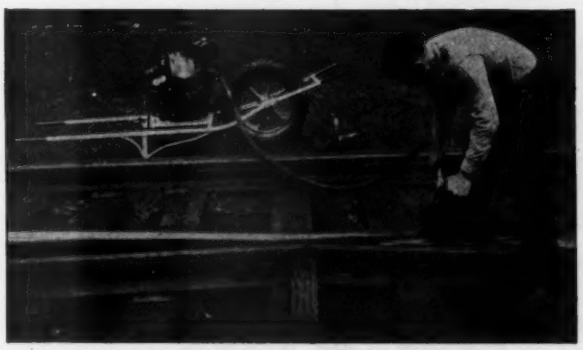

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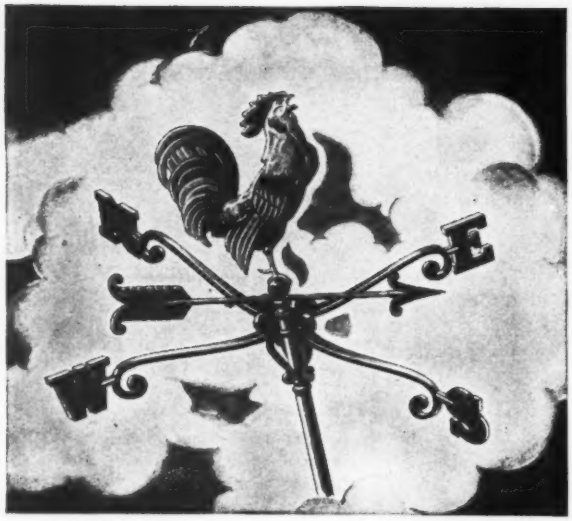
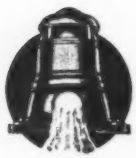


WATER—FOR SOME NINETY-MILLION PEOPLE



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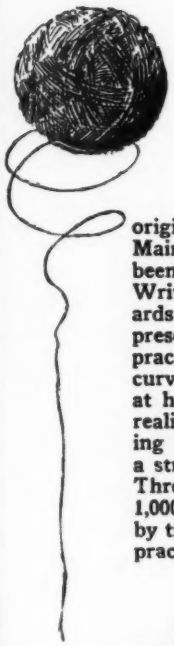

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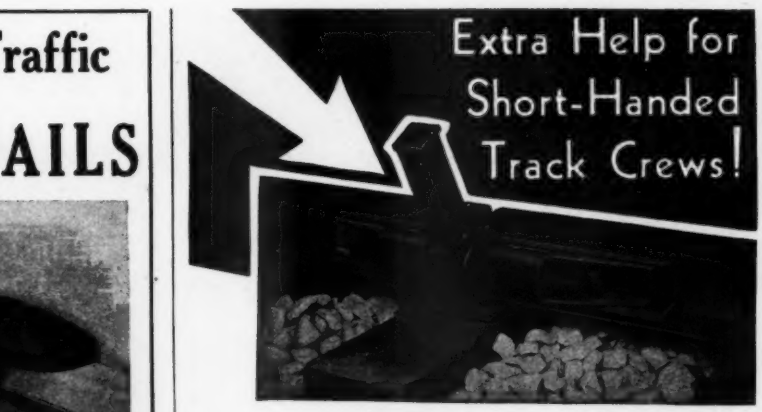

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JACKSON TAMPERS

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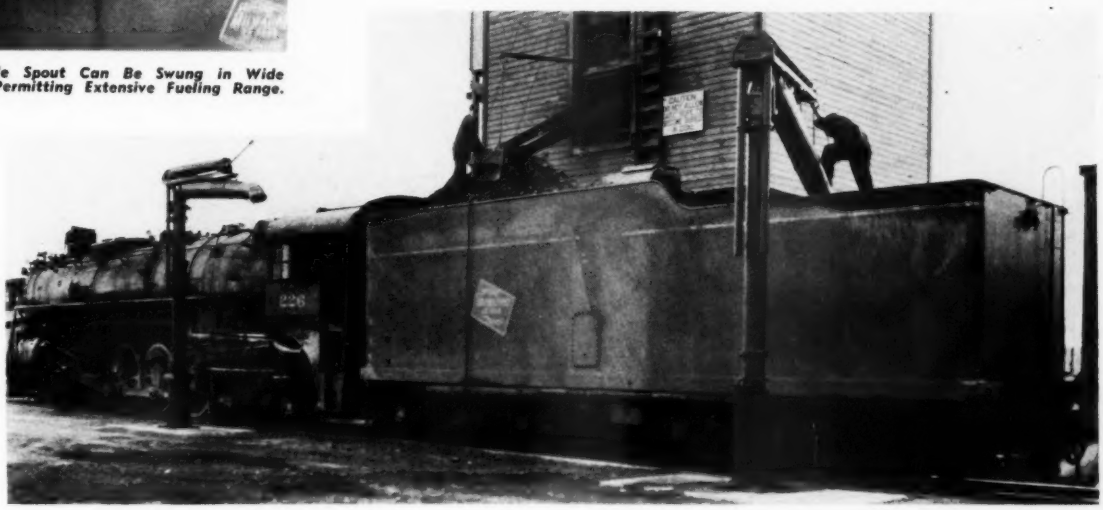

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Blue Brutes are with the Yanks today, keeping railroad supply lines open behind desert and jungle battlefields. They also helped the British 8th Army keep Rommel on the run. Farther behind the lines, here at home, Blue Brutes in "uniforms" of olive drab or battleship gray‡ are serving in hundreds of Army camps, Navy yards, air bases and ordnance plants.

Get more WORTH from air with WORTHINGTON

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